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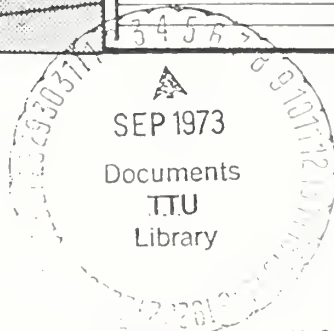
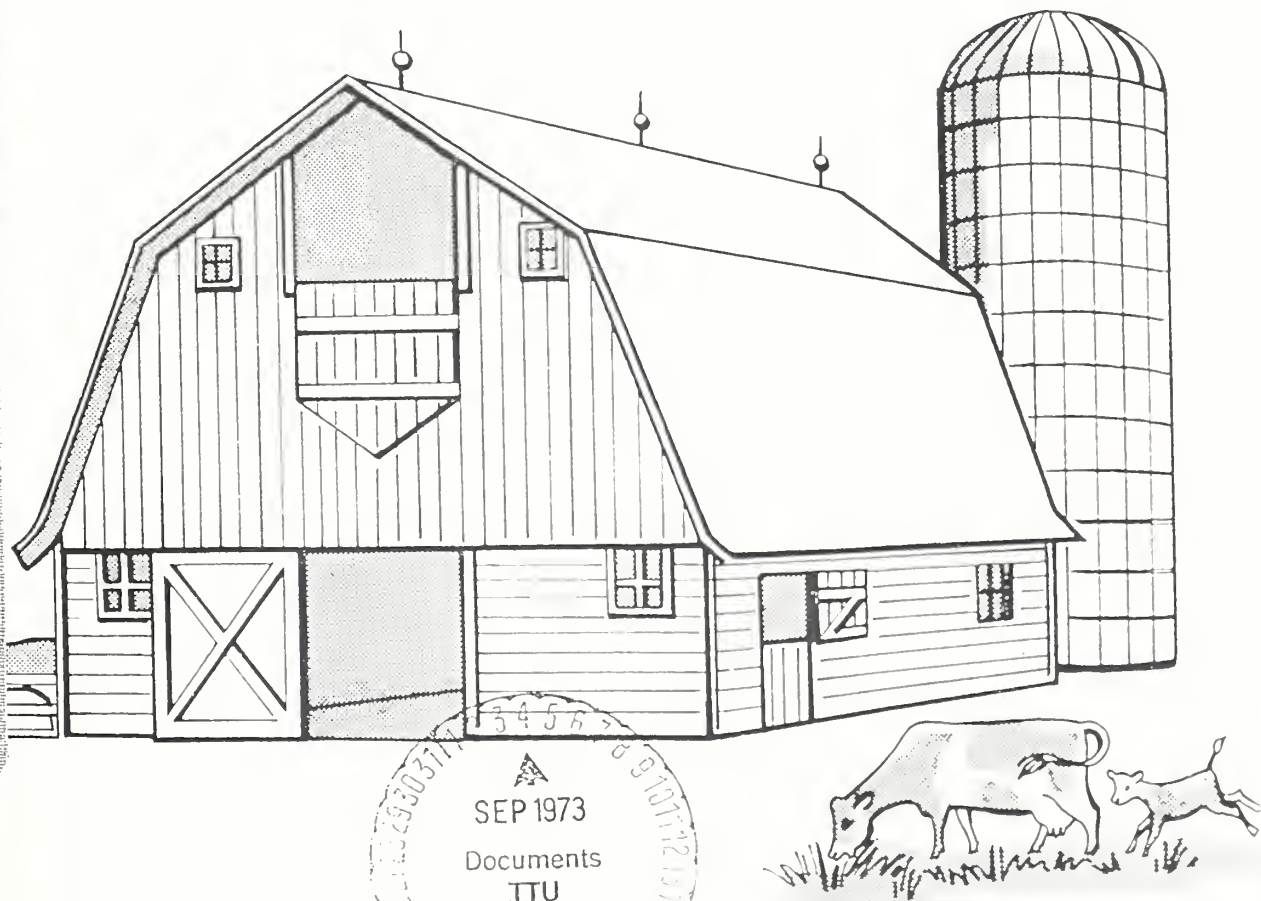
FARMING IN THE CLASSROOM TEACHER'S
GUIDE

AGRICULTURE DEPARTMENT
AGRICULTURAL RESEARCH SERVICE

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FARMING in the CLASSROOM TEACHER'S GUIDE



Science Study Aid No. 8

AGRICULTURAL RESEARCH SERVICE

• U.S. DEPARTMENT OF AGRICULTURE

THE AGRICULTURAL RESEARCH SERVICE

... dedicated to improving the quality of life

ARS, the U.S. Department of Agriculture's major research agency, helps provide the knowledge and technology that make it possible to grow, process, and distribute enough food for everyone in the U.S. and many people abroad.

Other ARS goals are to:

- develop creative ways of managing soil and water resources to assure a cleaner environment and continuation of a strong agriculture,
- determine how food affects health, and help all Americans eat proper diets,
- create economic opportunities for rural families,
- develop new products for consumers and new industrial uses for farm commodities,
- assist in expanding export markets for agricultural products.
- help people in developing nations improve their capacity to produce food.

The basic and applied work of this agency is conducted at more than 250 locations in this country and abroad.

ARS scientists involved in basic research recently developed a safe, effective vaccine for cancer-like Marek's disease of poultry, the first time any vaccine has been used successfully with cancer; isolated and identified a new kind of disease-causing particle called the viroid, which may offer added clues to the causes of human diseases; and determined the importance of zinc in the human diet, especially during pregnancy.

Products developed through the years include improved wash-wear and flame-resistant cottons; frozen concentrated fruit juices and other convenience foods; washable woollens that stay soft and pliable and keep their press during washing; special high-protein foods; and aerosols . .

Cooperating ARS scientists also work with science teachers to provide learning experiences through Science Study Aids. These presentations should heighten students' interest in agriscience as it relates to the world around them.

FARMING in the CLASSROOM



U.S. DEPARTMENT OF AGRICULTURE

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RESOURCE MATERIALS

USDA Publications

Single free copies of the following publications are available from the United States Department of Agriculture, Washington, D.C. 20401:

Beef Cattle Breeds, FB 2228.

Breeds of Swine, FB 1263.

Brooding Chicks with Infrared Lamps, L 397.

Facts About Pasteurization of Milk, L 408.

The Farm Beef Herd, FB 2126.

Dairy Council Materials.

The following publications, films, and filmstrips are available from the National Dairy Council, 111 North Canal St., Chicago, Ill. 60606.

Publications

More Milk Please (B27) - 15 cents

My Friend, the Cow (B98) - 15 cents

Let's Take Milk Apart, (Student's Manual) (B118) - 20 cents

Ice Cream for You and Me (B269) - 30 cents

Film and Filmstrips

Uncle Jim's Dairy Farm (F11) 16 mm., sound, color film. 12 min. \$65.00.

Life on a Dairy Farm (F608) 35 mm., color filmstrip and record, 46 frames. \$5.00.

BIBLIOGRAPHY

Arbuckle, W.S., *Ice Cream*, AVI Publishing Co., Inc., Westport, Conn. 1966.

Bashook, Philip G., "A Window on Life—Chick Embryo Culturing", *The Science Teacher*, vol. 39, No. 1, Jan. 1972, pp. 51-54.

Challand, H.J., and E.R. Brandt, *Science Activities from A to Z*, Science Center, National College of Education, Childrens Press, Inc., Chicago, Ill. 1963.

Quigley, George D., *An Incubation Project*, University of Maryland, College Park, Md., MEP 277, Feb. 1962.

VOCABULARY

Beak—The bill of a bird or fowl. It is made of a horny substance and is used to pick up food.

Billy goat—a male goat.

Boar—Male hog or pig.

Bristle—The stiff, glossy hair on the back of pigs. It is used in brushes.

Bull—The male of the "cow" family.

Calf—A young cow or young bull.

Chick—A young chicken.

Colt—A young horse.

Comb—Fleshy, red growth on top of the head of some fowl. The rooster is usually identified by his large comb.

Cow—The mature female of the "ox" family. Most of the milk we use for food comes from cows.

Down—The fine, soft feathers under the outer layer of feathers on ducks, geese, chickens, and other birds.

Drake—A male duck.

Duck—A swimming bird with a flat bill, short neck, and webbed feet.

Duckling—A young duck.

Ewe—A female sheep.

Filly—A young female horse.

Fleece—The wool coat worn by sheep and other wool-bearing animals.

Fowl—Domesticated and wild birds that may be used as food.

Gander—A male goose.

Goose—A long-necked, web-footed bird similar to a duck but larger.

Heifer—A young cow that has not yet had a calf.

Hen—A female chicken.

Hog—A full-grown pig.

Hoof—The horny covering on the feet of horses, cows, sheep, and other animals.

Kid—A young goat.

Lamb—A young sheep.

Mare—A female horse, donkey, or burro.

Nanny goat—A female goat.

Pig—A domesticated swine used for food. It has a thick body covered with coarse bristles.

Piglet—A baby pig.

Pony—A small horse, usually not over 14 hands (56 inches) high.

Rabbit—A burrowing rodent of the hare family.

Ram—A male sheep.

Roost—Any place, as a pole or perch, where a bird rests at night.

Rooster—The male chicken.

Tom—A male turkey.

Udder—The milk secreting and holding gland of cows, goats, and similar animals.

Wattle—The featherless, fleshy piece of skin hanging from the head or throat of some birds.

ACTIVITY I: IDENTIFYING FARM ANIMALS

Objective:

To identify common farm animals by their physical characteristics.

Materials:

Farming in the Classroom workbook. Distribute pages 1, 2, and 3. Students will also need these pages for later activities. The coloring book or parts of it, could also be introduced and distributed at this point.

Procedure:

1. Ask the children to look at the pictures of the animals in the workbook and determine which are alike, which are different, and why. If an overhead projector is available, this is a good time to show pictures of animals from the workbook or other sources.
2. Encourage the children to discuss the names given the adult male animals, adult females, and the young.
3. Describe the body covering of each animal.
4. Discuss the importance of the animals to man.

5. Have the children imitate the sounds made by some of the animals.

6. You may also wish to use part of the coloring book.

ACTIVITY II: EXPERIMENTING WITH MILK AND MILK PRODUCTS

Milk belongs in every diet, but it is particularly important to young people who are growing. Young people need milk because it is the best source of calcium, the mineral that helps build strong bones and teeth. Milk provides high-quality protein and the B-vitamin riboflavin.

Most of the milk used in the United States is from cows, but other people in the world use milk from other animals, such as goats, sheep, and horses.

In these experiments, the class will examine milk and make a few milk products.

Tell the students that the butter, cottage cheese, and ice cream they make may not be the same as the products purchased from the store. While the classroom products may have the familiar texture or consistency, they may not have the same taste and color.

Explain the differences as part of the experiment.

Sources of Milk

Objective: To identify the animals that provide us with milk.

Materials:

Milk (enough for each child to have a cup).

Paper cups.

Workbook, page 7, *Story About How Mother Uses Milk At Home*.

Coloring book; drawings of cow (p. 11) and other mammals.

Procedure:

1. Give each child a cup of milk to drink.
2. Have the children complete page 7 of the workbook and color the cow (p. 11) of

the coloring book; they may color other mammals also, if you wish.

3. Discuss why milk is such an important part of the children's diet.
4. Discuss pictures of other milk-producing animals.

Making Butter and Buttermilk

Objective: To make butter using a simple churn (jar).

Materials:

- Box of crackers (enough for each child to have at least one).
- Crushed ice and container.
- Cups, for buttermilk.
- Half-and-half milk (enough for each child to have a half cupful).
- Plastic knives.
- Salt.
- Small glass jars (two or three children can share a jar) with tight-fitting tops.
- Thermometer (Fahrenheit, immersion).
- Sheet of paper to be headed "Story of Butter Making," and coloring book, if you wish.

Procedure:

1. Let the milk stand until it reaches room temperature (about 70° F.)
2. Pour the milk into the jar (churn), put the top on securely, and shake it vigorously until clumps of butter appear. Butter should form after about 5 minutes of shaking. Let the children take turns shaking the jar.
3. Pour off the buttermilk and set the churn in a container of ice to harden the butter by chilling it. You may wish to add salt to both butter and buttermilk.
4. Children can sample the buttermilk while waiting for the butter to chill. Or, you may wish to chill the buttermilk too.
5. After the butter hardens, let the children spread it on crackers and taste it.
6. Have the children write their butter-

making story. One of the mammal pictures can be distributed for the coloring activity.

Making Cottage Cheese

Cottage cheese is an economical food made of skim milk. It is easy to make in small quantities and requires no special equipment.

This soft, white cheese is nutritious and can be used as a substitute for meat. Each pound of cottage cheese furnishes as much protein, or body building material, as the same amount of beef. However, it does not provide as much energy as meat.

Objective:

To make cottage cheese from skim milk.

Vocabulary:

Curd—The soft, semisolid part of milk from which cheese is made.

Junket—A preparation of curdled milk and cream that has been sweetened.

Pasteurized milk—Milk that has been heated to kill bacteria.

Rennet—A substance used to curdle milk.

Skim milk—Milk with the cream removed.

Whey—The thin, watery part of milk. It is separated from the curd in making cheese.

Materials:

Collecting bowl or container, 4-quart capacity.

Double boiler, 4-quart capacity. You can improvise such a boiler with two containers, one large enough to fit inside the other (see page 13). The small container must be large enough to hold 4 quarts.

Draining cloth (cheesecloth).

Junket tablets or liquid rennet.

Pasteurized skim milk, 1 gallon (a gallon makes 1 to 1-1/2 pounds of cottage cheese).

Salt.

Saltines or graham crackers (enough for each child to have one).

Thermometer.

Procedure:

1. Heat water to 80° F. in the bottom part of the double boiler or in the outer container of the improvised boiler. Use a thermometer to determine water temperature—do not guess at it.
2. Pour the skim milk into the top part of the double boiler or the inner container of the improvised boiler.
3. Dilute 2 or 3 drops of liquid rennet in a tablespoon of cold water and stir it into the milk. If rennet is not available, add 1/8 of a junket tablet to a tablespoon of water and add it to the milk.
4. Allow the milk to remain at 80° F. until it curdles—in about 12 or 18 hours. During this period no special attention is necessary.
5. Place the curd in a drain cloth over a container to drain the whey. Occasionally, pour out the whey that collects in the container so that the draining can continue. In 15 to 20 minutes, the curd will become mushy and will drain more slowly. When it is almost firm, and the whey has nearly ceased to flow, the cheese is ready for salting and eating.
6. Salt the cheese to taste.
7. Have the children spread the cheese on crackers and taste it.

Making Ice Cream

Ice cream has more appeal for children than any other dairy product. Although this procedure contains a recipe, you may substitute any convenient recipe you desire.

Objective: To make ice cream in the classroom.

Materials:

Bowl, 2- or 3-quart size.
Coarse salt, 2 pounds.
Cracked ice, 5 pounds.

Mixing spoon.

One-gallon freezer, hand crank or electric.

Paper cups (one for each child).

Plastic spoons (one for each child).

Ingredients:

1-3/4 quarts light cream.

1/2 pint evaporated milk.

1 tbsp. gelatin dissolved in 1/2 cup cold water.

Pinch of salt.

1 tbsp. vanilla.

Procedure:

1. Put ingredients in the bowl and mix thoroughly.
2. Pour the mixture into the ice-cream container of the freezer. Fill the container not more than 3/4 full. As the freezer operates, air will enter the mixture and it will expand as it freezes.
3. Place the container in the freezer pail, cover it, and adjust the top. Make sure the cover is tight.
4. Pack ice and coarse salt around the container (use 1 part salt to 4 parts ice).
5. Turn the crank slowly if hand operated, or let the freezer run normally if electric, until the ice-cream mixture is hard enough to stick to a spoon. This step should take from 12 to 20 minutes.
6. Carefully remove the dasher from the container, then replace the cover of the container.
7. Drain the brine (mixture of salt and melted ice) from the freezer pail and add more coarse salt and cracked ice.
8. Cover the top of the ice-cream container with a layer of ice. Then cover the top of the freezer with newspapers or other covering that will provide insulation. Let stand for 2 to 3 hours to harden the ice cream (although it can be eaten soft).
9. Give each child some ice cream in a paper cup.

ACTIVITY III: HATCHING AND REARING CHICKS

Most of us know *something* about chicken eggs. We eat them, cook with them, and decorate them at Eastertime. The egg shell is one of Nature's most perfect packages. Although fragile, it can withstand great pressure applied from end to end.

No matter how many uses people may find for the egg, it is most important as the birthplace of the chicken.

For an egg to hatch, it must be kept warm and turned from time to time. The mother hen usually takes care of this as she sits on her eggs in the nest. Eggs can also be hatched in an incubator.

Most State universities have detailed educational materials available on poultry projects. Contact the Poultry Department of your State University, or your local Extension Service office.

Hatching Eggs

Objective: To demonstrate the use of an incubator for hatching eggs.

Vocabulary:

Broiler—A chicken from 8 to 12 weeks old, weighing 2-1/2 pounds or more, sufficiently tender to be broiled.

Gizzard—The second stomach of a bird. It has thick muscular walls and a tough lining for grinding or crushing coarse feed particles only partially digested in the first stomach.

Incubate—To keep fertile eggs under conditions favorable for hatching.

Mash—A poultry feed made of ground grains with necessary protein, vitamins, minerals, and other nutrients.

Pipped egg—An egg through which the chick has forced its beak in the first step of breaking out of the shell during incubation.

Scratch—Poultry feed consisting of a mixture of

cracked or whole grains (such as corn, oats, and wheat).

Materials:

Fertile eggs, 2 dozen. Available from hatcheries or poultry breeding farms.

Incubator. (A drawing of one is shown on page 14.) Directions for making an incubator are given on page 10.

Pan of water.

Thermometer.

Coloring book; pictures of feathered animals, pages 1 through 5.

Procedure:

1. Place the fertile eggs in the incubator.
2. If the heat of the incubator is applied from above the eggs, and no fan is used, operate at 102° to 103° F. If the incubator has a fan to circulate the air, then 99.5° to 100° F., is about right.
3. For the first 15 days, turn the eggs twice daily at intervals of 12 hours (or as close to this interval as possible). Position of the egg is important. It may lie on its side or with the large end raised to an angle of about 30 degrees. Under no circumstances should the small end be higher than the large end.
4. Record the temperature in the incubator each time you turn the eggs.
5. Provide a pan of water in the incubator at all times. Its surface should be about as large as the floor space the eggs would occupy if they were laid side by side in a group. The most common fault in school incubators is too much ventilation and too little moisture. This dries the eggs excessively, delaying or reducing hatching.
6. Do not turn the eggs after the 18th day of incubation and do not open the incubator; it should not be opened until the eggs hatch. If necessary to add water, open the incubator only momentarily and add warm water (110° F).

7. Check the eggs each day. Late on the 19th day, some chicks will pip or break the shell. By the 20th day many chicks will have hatched. If everything has been done correctly, the chicks will be dried and fluffed in 21 days, plus 6 to 8 hours, after the incubator was set.
8. After the 21st day, if some of the eggs are pipped but not yet hatched, place some boiling water in the water pan to steam up the incubator. If after another 2 to 3 hours, the chicks have not emerged, try to help them by carefully picking away the shell. Occasionally, a chick will die before it hatches—this is to be expected.

Rearing Chicks

Chicks should be fed as soon as they hatch, although they will not suffer for lack of food or water until after 48 hours. Give them a chick “starting mash” obtainable at any feed, farm supply, or pet store.

Rearing chicks as a classroom project has its practical limitations. If you do not have specific plans for disposing of the chicks at the end of the study, the local humane society should be contacted for recommendations. If the chicks are to be kept for a few days they should be kept in a brooder (see drawing, p. 15). Directions for building a brooder are given on page 10.

Building a Classroom Incubator

Build the incubator several days before you plan to buy the eggs, because it will take a few days to get the temperature properly adjusted.

Materials:

- Cardboard boxes, two of different sizes (one 18 x 18 x 18 inches and one 16 x 16 x 16 inches would be ideal).
- Insulating material (crumpled paper or old cloth).
- Light bulb on cord.

Newspapers.

Thermometer.

Transparent material (plastic).

Procedure:

1. Put the smaller box inside the larger one and pack the space between them with insulating material as shown on page 14.
2. Line the floor of the box with newspaper.
3. Place the thermometer in the box away from where you will suspend the light bulb.
4. Suspend the light bulb inside the inner box and attach the transparent material so that it can be removed to allow replacement of light bulbs.

Test bulbs of different wattage until you find one that keeps the temperature at 102° to 103° F. for a full day.

You can also adjust the temperature by adding or removing insulation or punching four to six 3/4-inch ventilation holes in the walls. Tape or wads of paper can be used to close the holes to control the temperature.

You can purchase a simple ether-wafer thermostat for a few dollars. By attaching it to the head bulb, you can regulate the temperature within 1/2° F.

Building a Classroom Brooder

Materials:

- Cardboard.
- Chicken wire, 12 square feet.
- Feeder or food tray.
- Hanging lamp with 25-watt bulb.
- Mash (feed).
- Newspaper.
- Orange crate (slats removed).
- Plastic.
- Scratch (feed).
- Thermometer.
- Water jug.

Procedure:

1. Divide crate in half with a cardboard

partition in which a little door has been cut, as shown on page 15.

2. Cover the sides and top of one half of the crate with chicken wire. Make a wire door to cover the other half of the top. This will be a door through which you can supply food and water to the chicks.
3. Cover two sides and top of the other half of the crate with cardboard.
4. Line both sections with newspapers. The paper should be changed daily.
5. Place the thermometer in the box where it can be seen but away from the light bulb.
6. Install the hanging lamp (with 25-watt bulb) in the closed section to provide heat when the room temperature drops at night. Maintain temperature in the brooder at 90° F. for the first week. Drop the temperature 5 degrees each week until you reach 70° F. and hold it at that temperature thereafter. Experiment with light bulbs of different sizes until the right temperatures are reached. The temperature can also be adjusted by punching ventilation holes in the cardboard.
7. Attach the plastic window on the third side of the closed section.
8. Place the feeder or food tray and water jug in the exposed section.

ACTIVITY IV: MAKING A PILLOW

Many years ago, fortunate families had mattresses made of eider down, the feathers from eider ducks. Today, such mattresses are expensive and very rare. Feather pillows are still being made, although foam plastic or other man-made stuffings for pillows are common.

Objective:

To demonstrate a use for the fine, soft feathers by making down pillows.

NOTE: Keep in mind that you are going to have feathers all over the room. Some students may be allergic to feathers. You may want to

exclude them from the room during this experiment. As an alternative activity, you could let them make pillows of foam rubber or plastic.

Materials:

Feather pillow (to be used as source of feathers).

6-inch squares of fabric (two for each child).

Tapestry needle (one for each child).

Yarn.

Workbook, page 8.

Coloring book; any feathered animal pictures.

Procedure:

1. Give each child two 6-inch squares of fabric.
2. Show the children how to sew the two pieces of fabric together on three sides.
3. Give each child a handful of feathers to stuff his pillow.
4. Have each child sew up the fourth side of the pillow.
5. Have the children complete page 8 in the workbook and color some feathered animal from the coloring book.

ACTIVITY V: EXPERIMENTING WITH WOOL

The interesting process of transforming fleece into yarn can be made simple enough for children to do.

Sheep are sheared with clippers; and shearing is like giving a close haircut. This is a highly skilled task. The shearing specialist holds the sheep between his knees and removes the fleece with hand-operated or electric clippers.

Objective:

To make yarn from wool.

Vocabulary:

Carding—Fluffing and separating wool fibers.

Dyeing—Dipping yarn into a vegetable coloring solution.

Grease Wool—Wool before it is washed (scoured).

Picking—Removing burrs, twigs, and other foreign particles from wool.

Scouring—To cleanse raw wool by washing.

Shearing—Cutting the fleece from sheep.

Spinning—Twisting wool fibers together into yarn.

Weaving—Interlacing the fibers into fabric.

Scouring, Picking, and Carding Fleece

Materials:

Container of hot water.

Fine-tooth comb (preferably metal).

Fleece (grease wool) Source: Contact your local sheep grower's association. Your Extension Service agent should be able to direct you to local sheep growers.

Soap flakes.

Workbook, pages 9, 10, and 12, and coloring book, pages 8 and 9.

Procedure:

1. *Scouring:* Put the fleece into the container of hot water. Add soap flakes. Hand wash the fleece and rinse well. Spread the fleece on paper to dry thoroughly.
2. *Picking:* Remove any burrs, twigs, or other foreign bodies from the dry fleece by picking them out by hand.
3. *Carding:* Comb the wool gently until the wool is fluffed and the fibers are separated.
4. Complete page 9 of the workbook.

Studying Fleece Under the Microscope

Put a small piece of wool on a slide and place it under a microscope. Note how the wool fibers are held together. Discuss your observations. Complete page 10 of the workbook and color pages 8 and 9 in the coloring book.

Spinning Yarn

Materials:

Pencil or dowel.

Thread spool (empty).

Wool (scoured, picked, and carded).

Workbook, p. 12.

Procedure:

1. Separate wool into strips about 1 inch wide.
2. Roll and twist a strip of wool fiber between your thumb and forefinger until you have a tight piece of yarn about 1/4 inch thick (see page 15).
3. After forming a few inches of yarn (step 2), pass the yarn end of the wool through the spool hole. Insert pencil or dowel into spool hole to hold the end and begin to wrap the yarn around the spool. This may be a two-student activity. One student can turn the spool slowly as another student rolls and twists the wool.
4. When the spool is filled, remove yarn and wind it into ball.
5. Complete page 12 of the workbook.

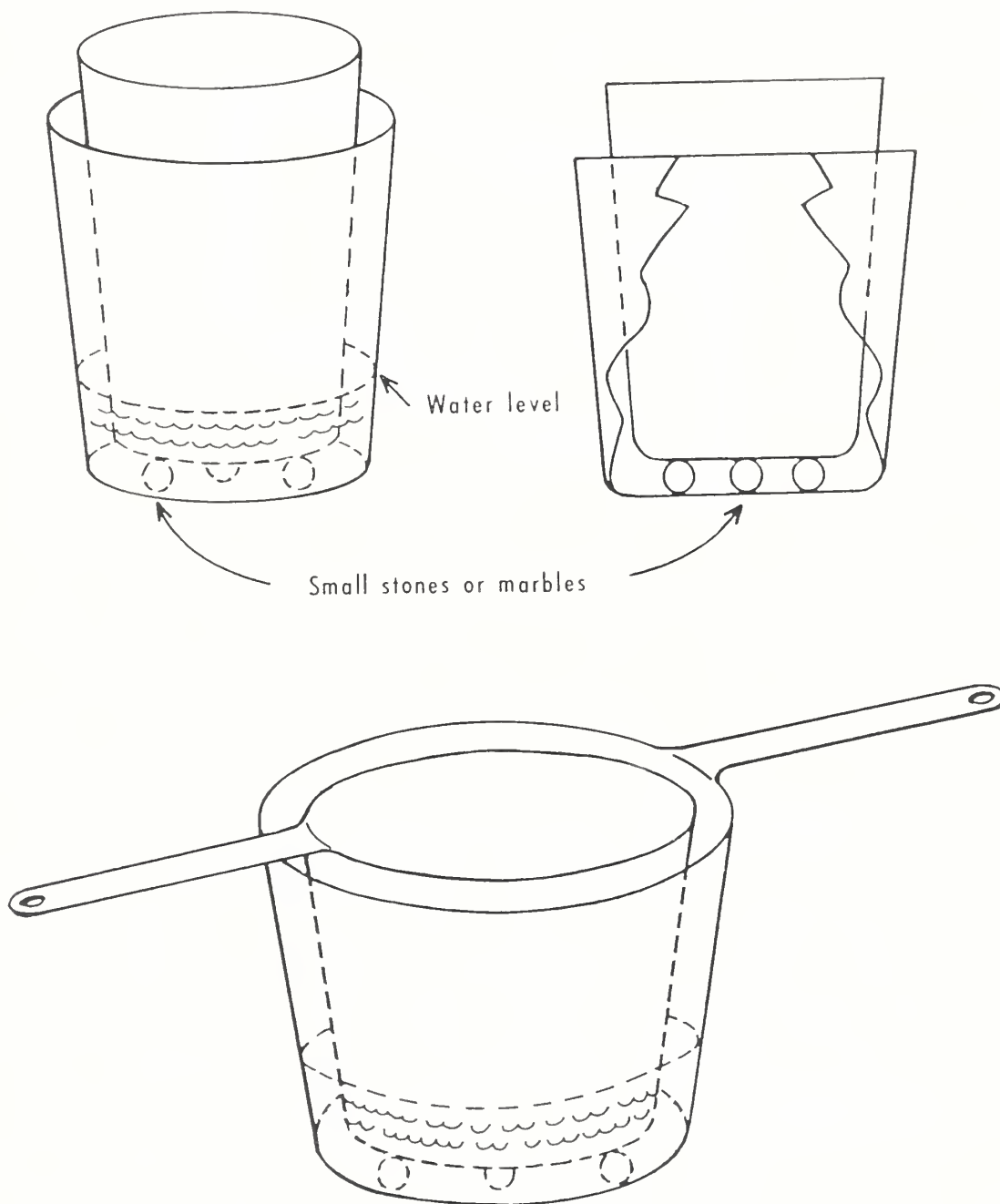


Figure 1.—An improvised double boiler

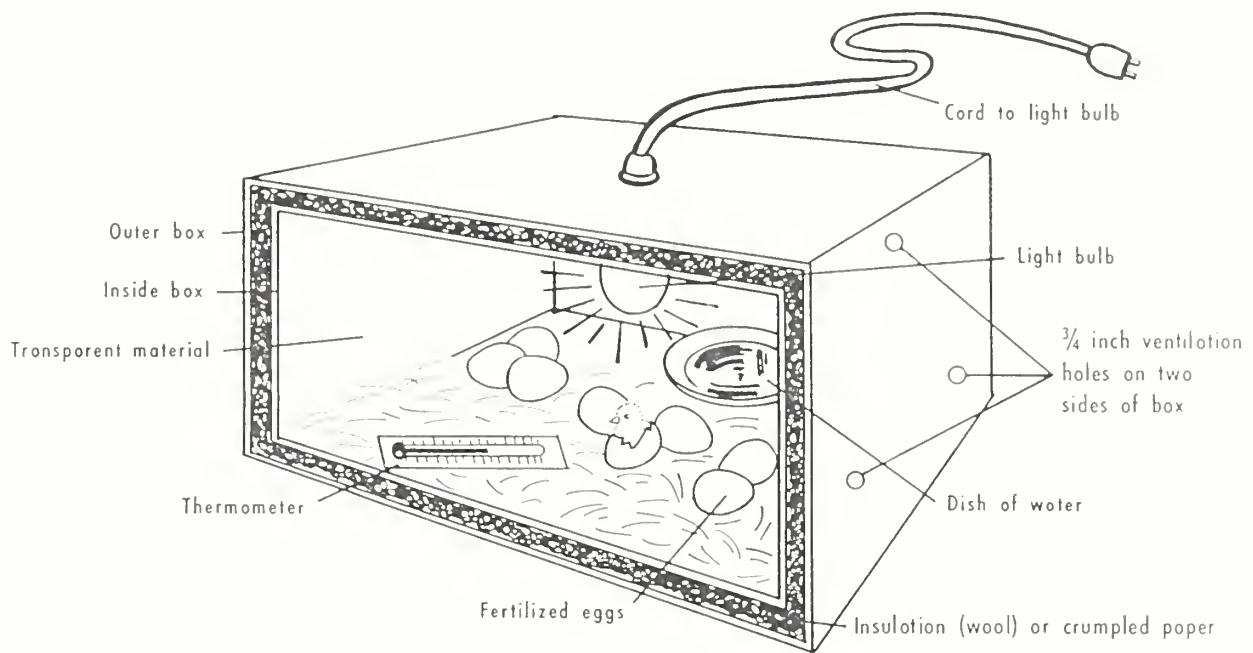


Figure 2.—A classroom incubator

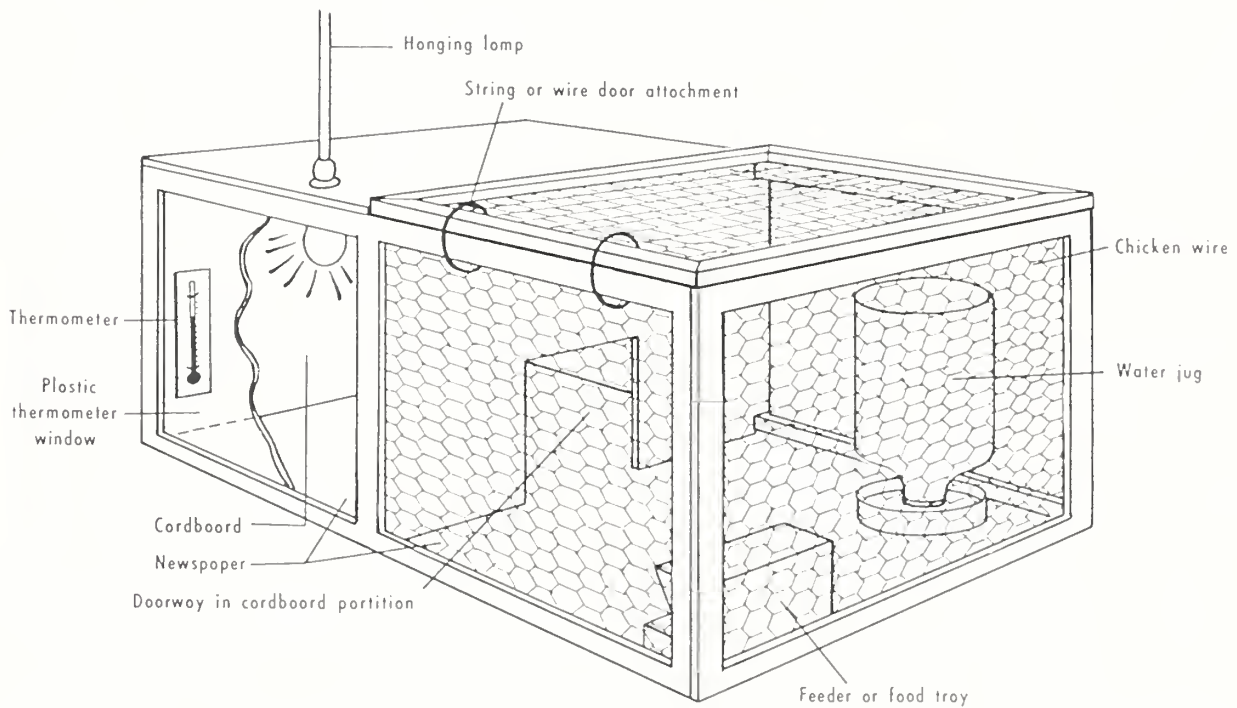


Figure 3.—A classroom brooder

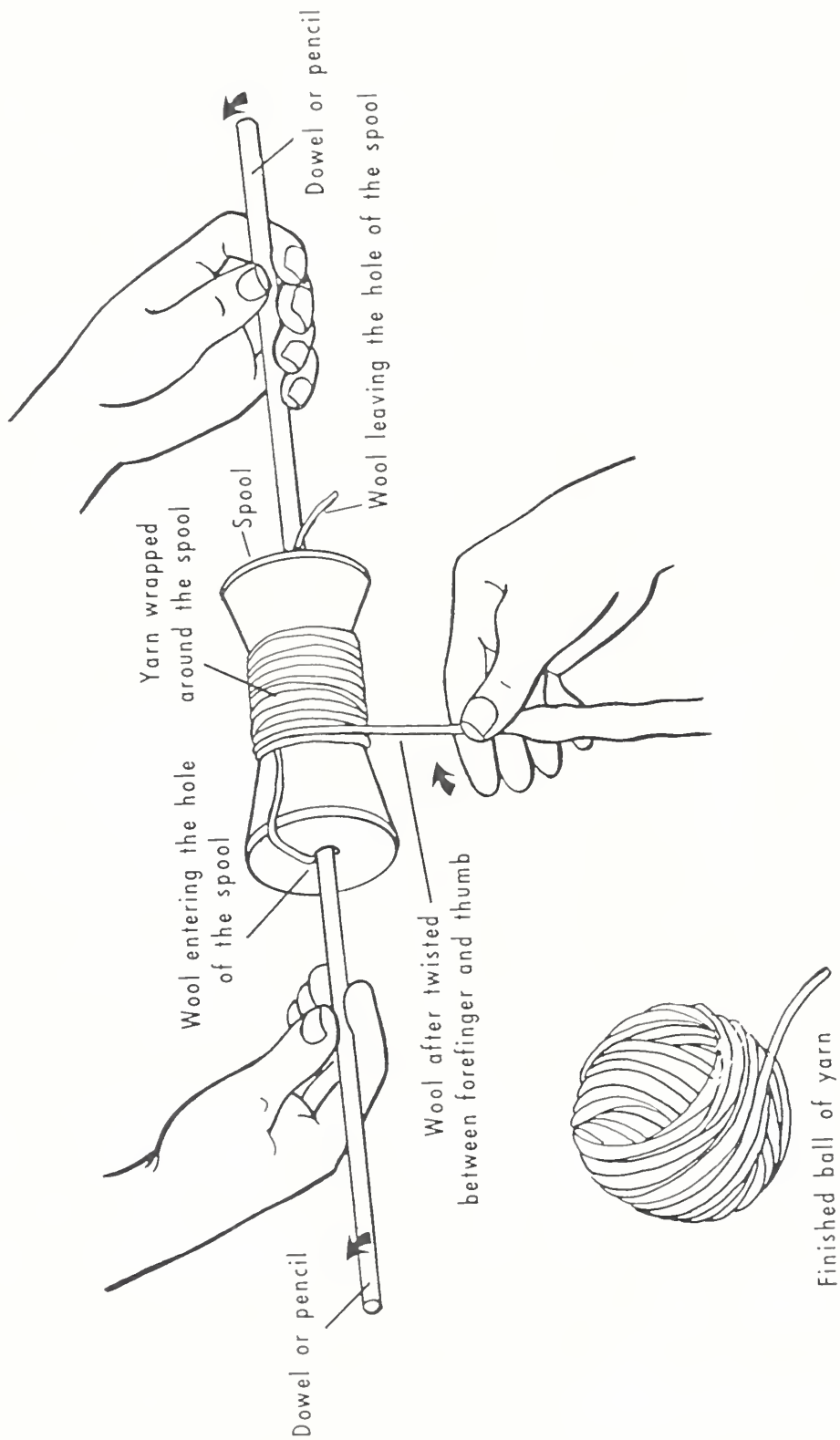
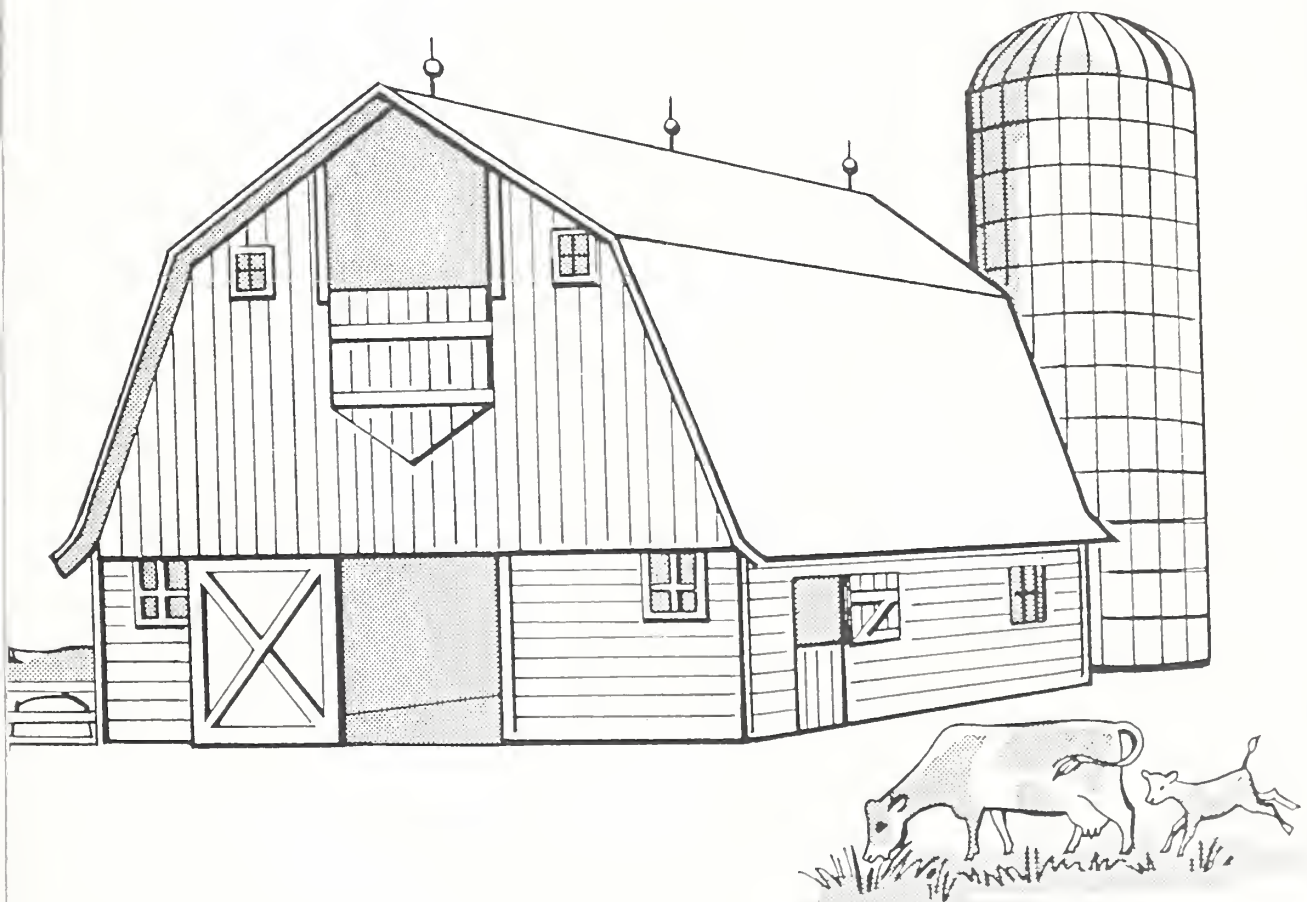


Figure 4.—Spinning yarn by hand

FARMING in the CLASSROOM WORKBOOK

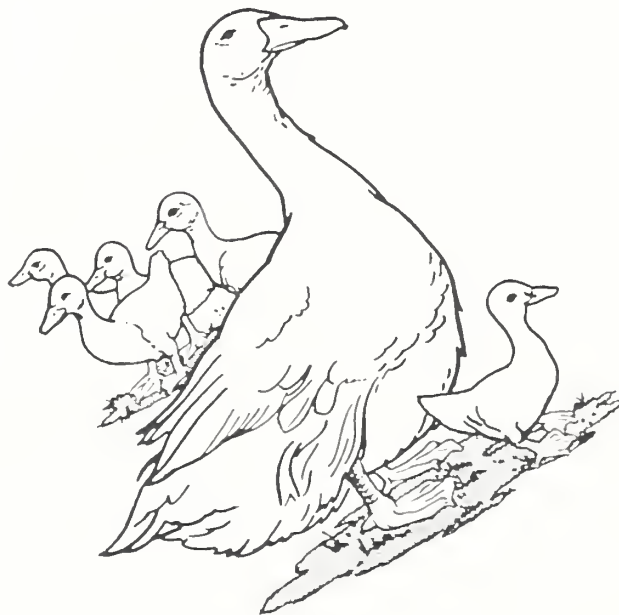
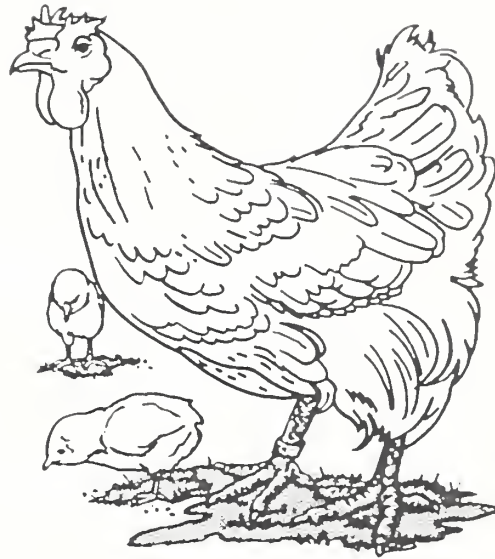
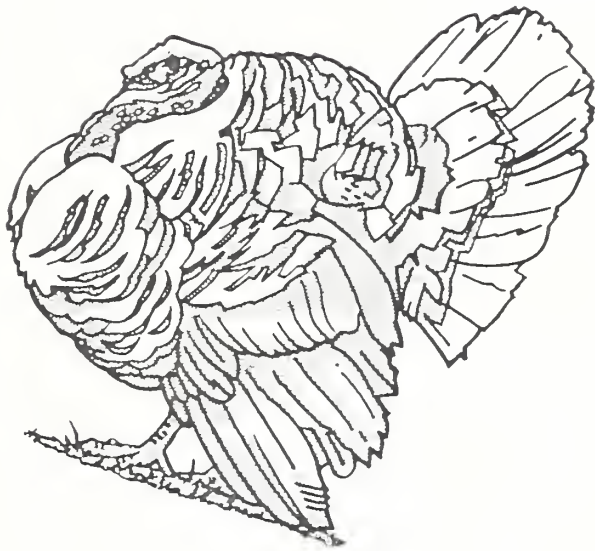


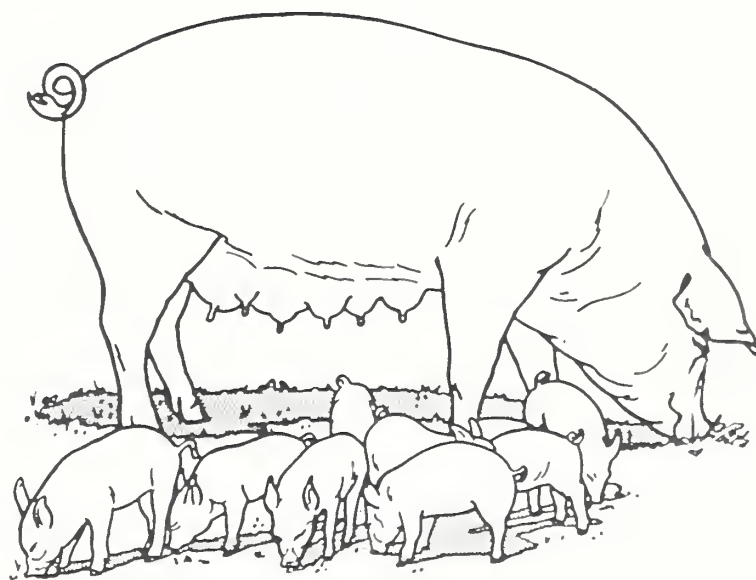
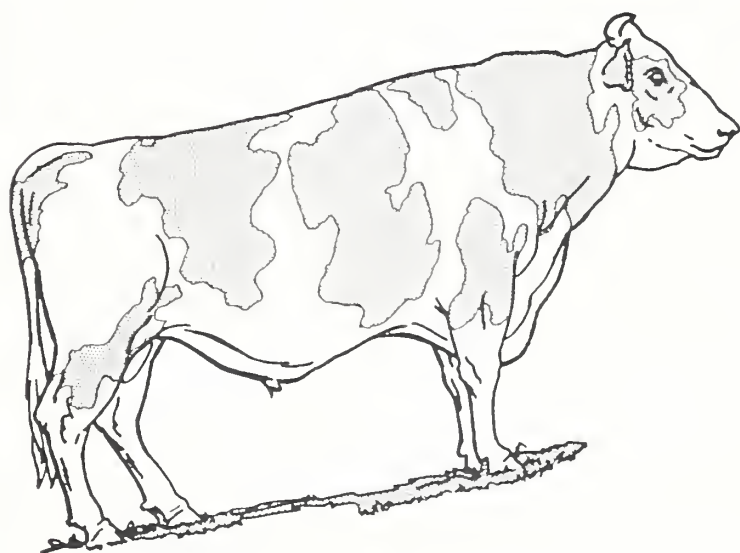
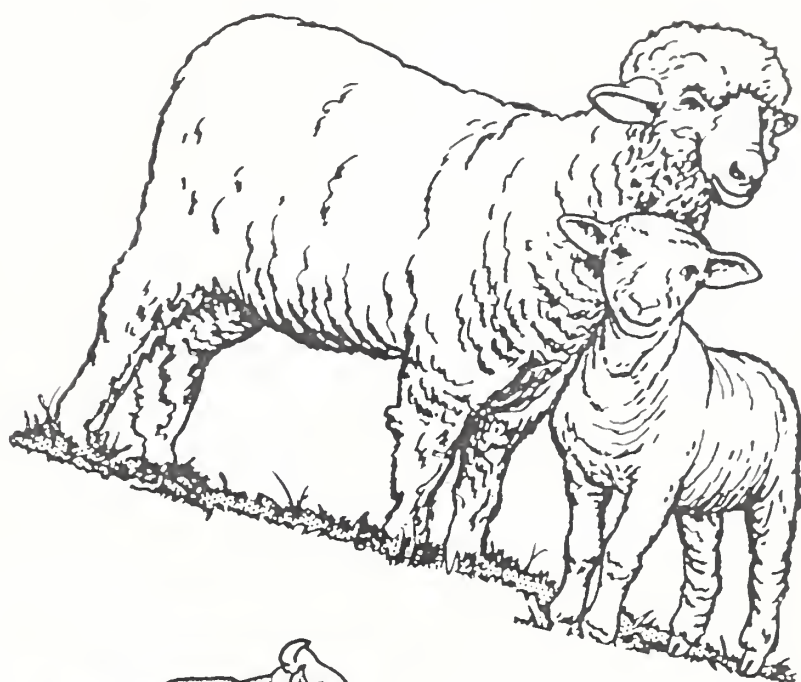
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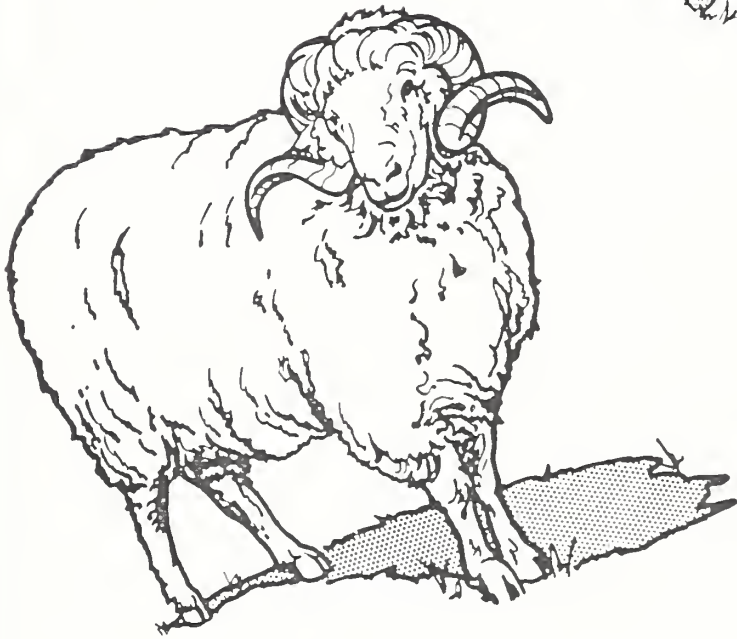
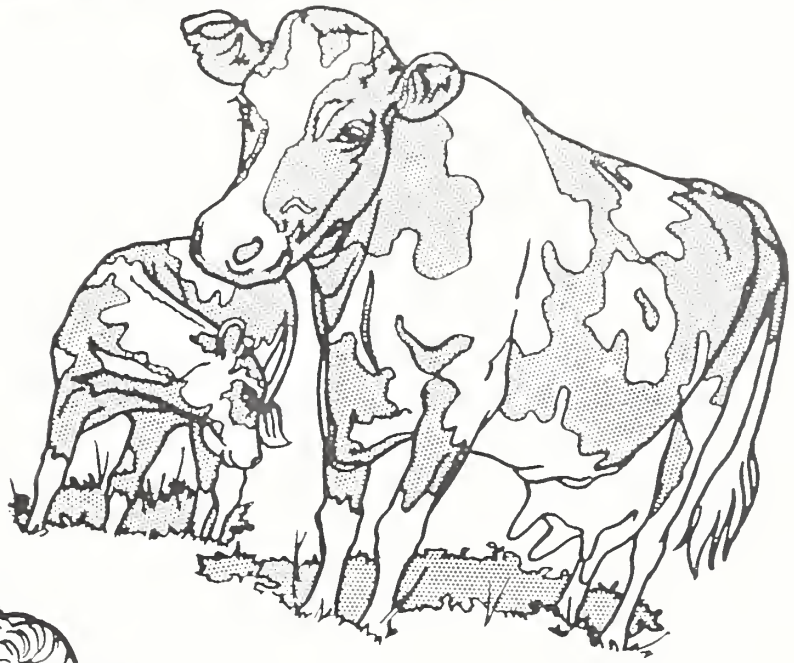
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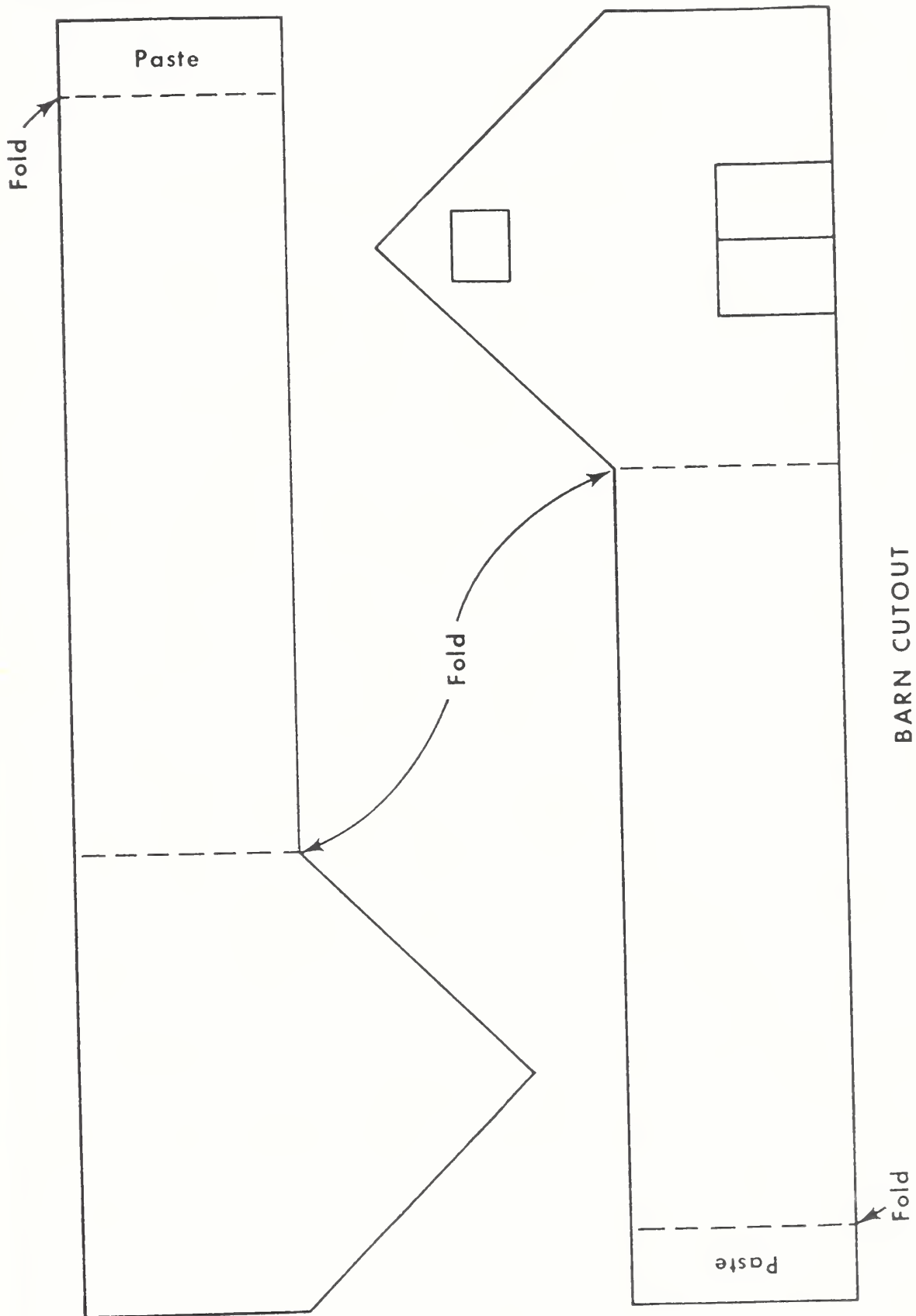


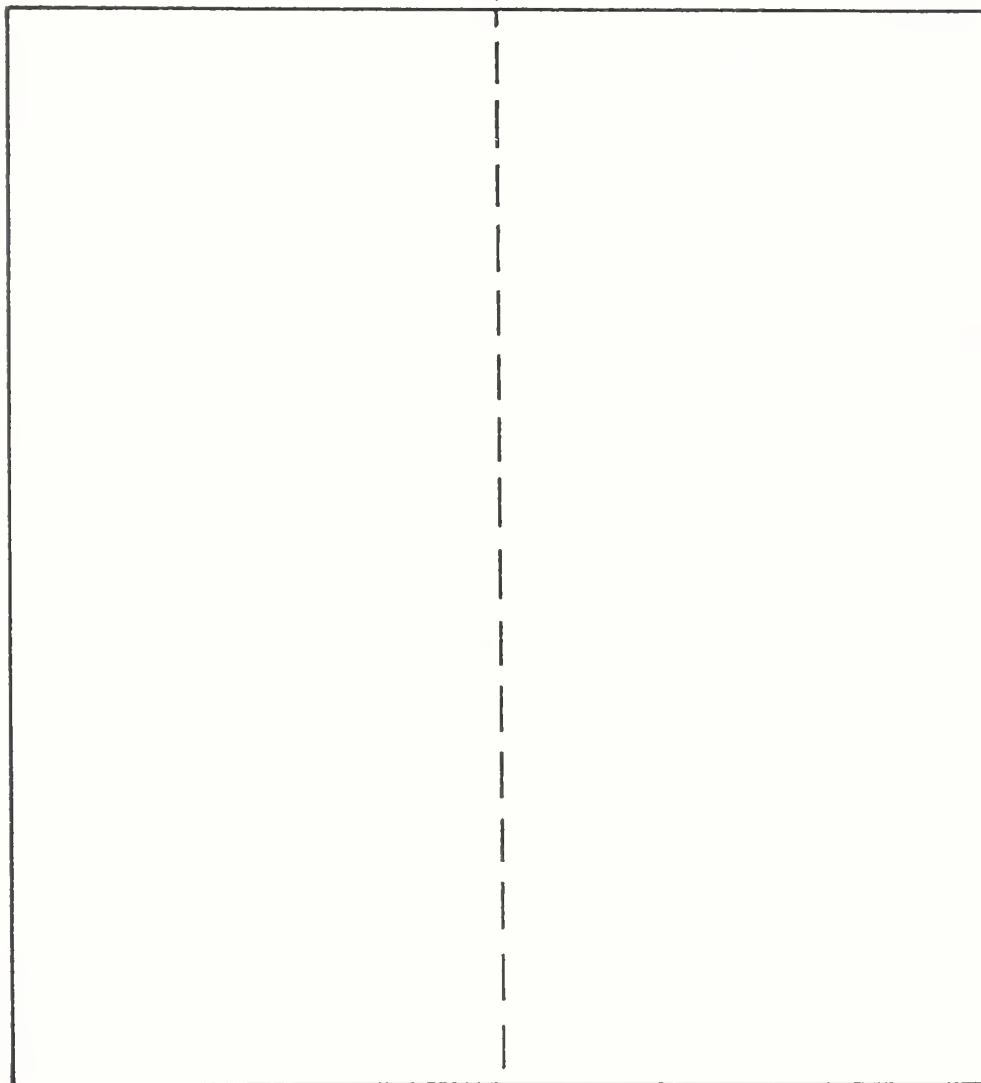
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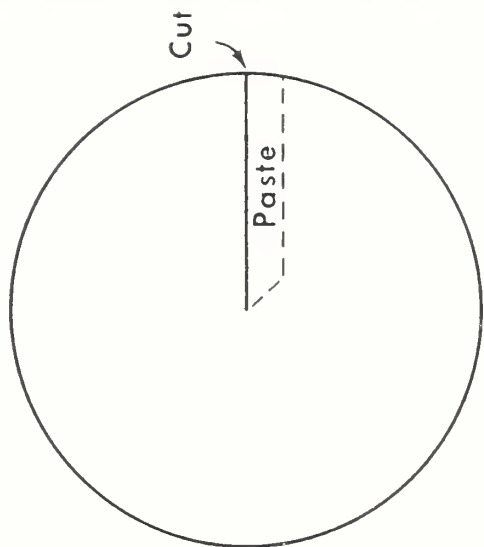
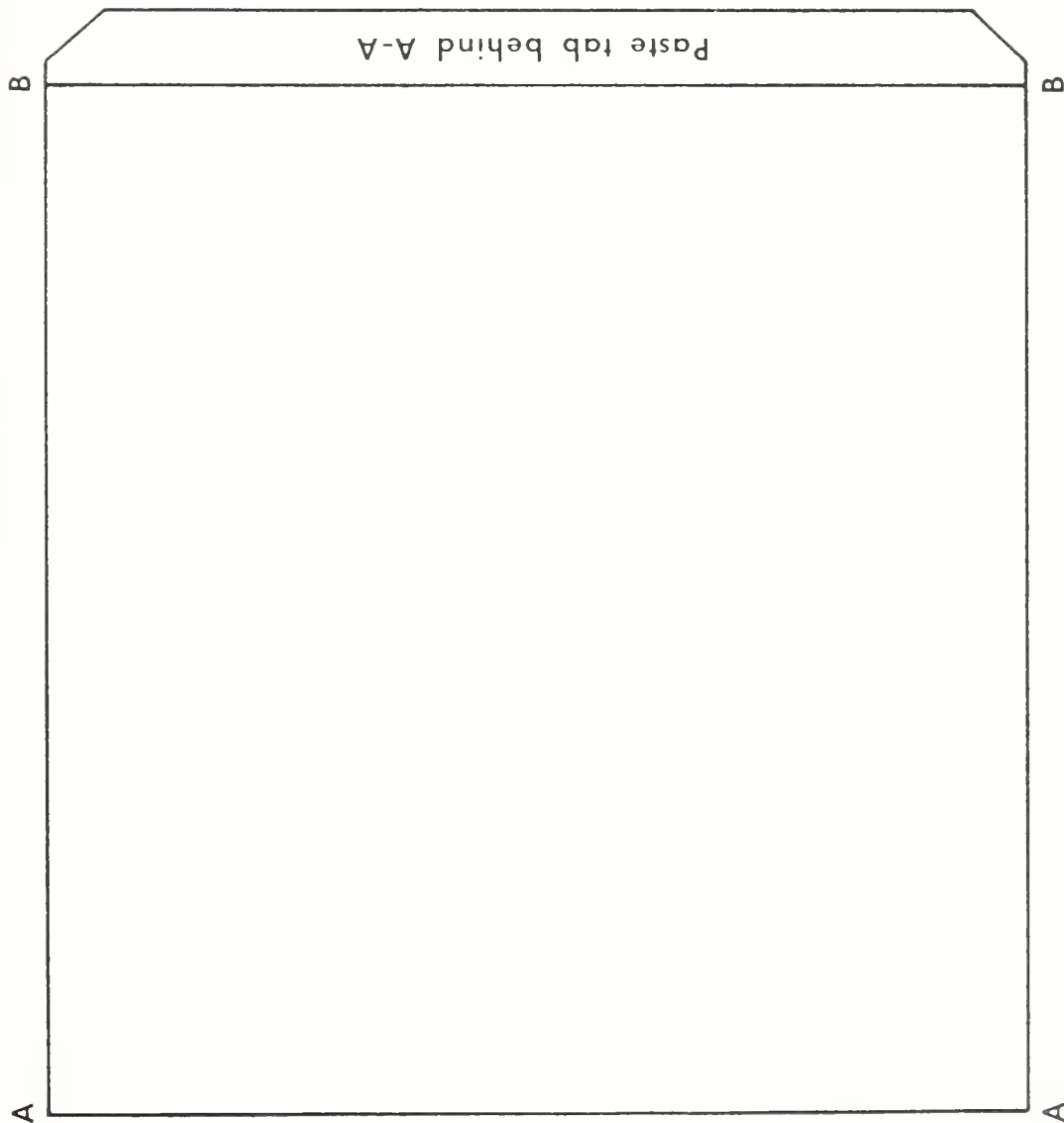








BARN ROOF CUTOUT



SILO ROOF
(Slit and form peak before
pasting tab underneath)

SILO CUTOUT

(Use 5" of 1½" cardboard tubing from roll of tissue or paper
towel for silo. If not available, use silo cutout above.)

Name of farm animal that produces milk _____
(color and cut animal from page 1, 2 or 3 and paste at the top of this page)

STORY ABOUT HOW MOTHER USES MILK AT HOME

Student's name _____

Name of farm animal that produces down _____
(color and cut animal from page 1, 2 or 3 and paste at the top of this page)

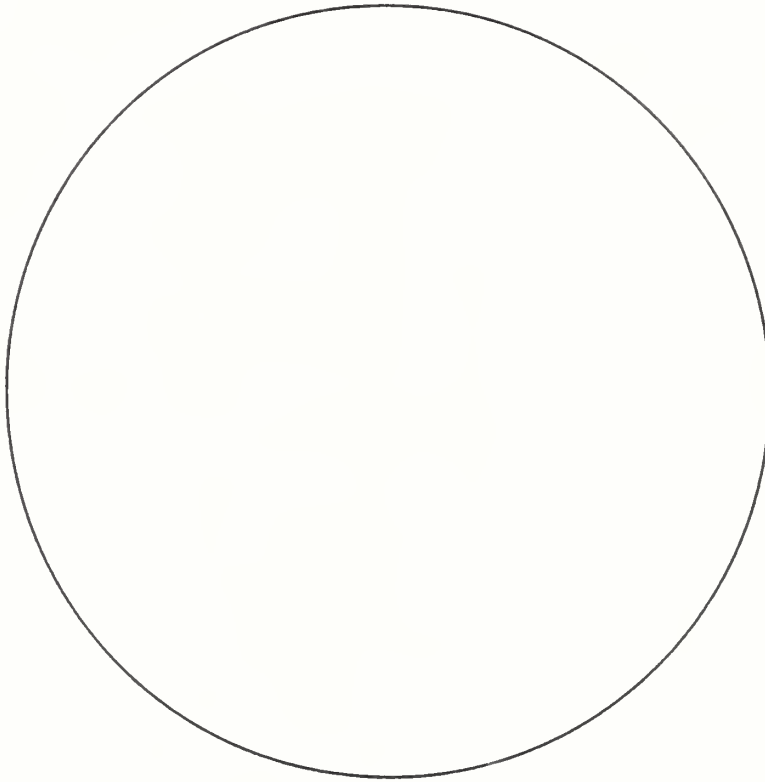
PILLOW MAKING STORY

Student's name _____

Name of farm animal that produces fleece _____
(color and cut animal from page 1, 2 or 3 and paste at the top of this page)

FLEECE: CARDING AND PICKING STORY

Student's name _____



Draw a picture, in the circle above, showing how
fleece looks under the microscope.

Student's name _____

BUTTER MAKING STORY

Student's name _____

Name of farm animal that produces fleece _____
(color and cut animal from page 1, 2 or 3 and paste at the top of this page)

STORY OF WASHING FLEECE

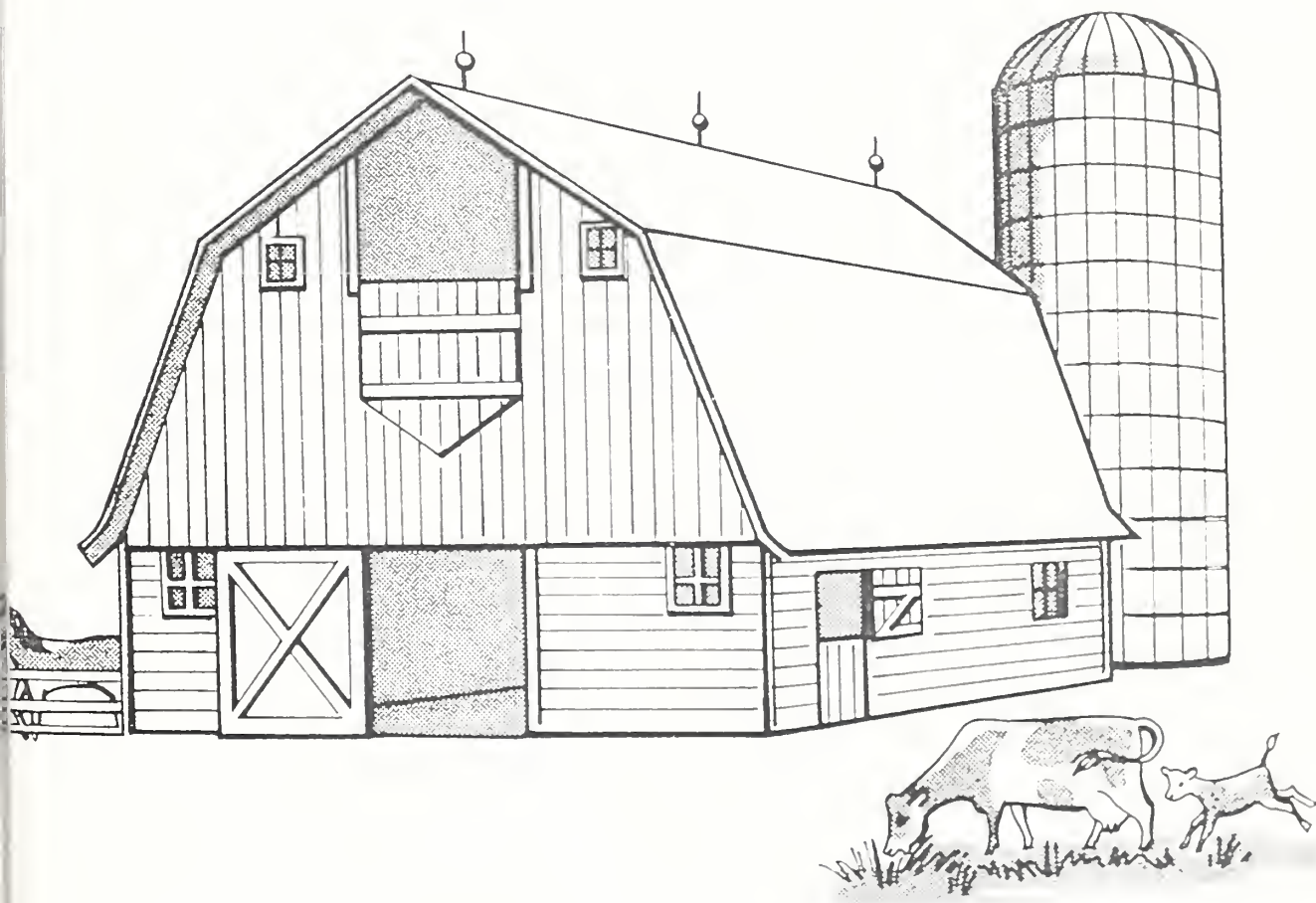
Student's name _____

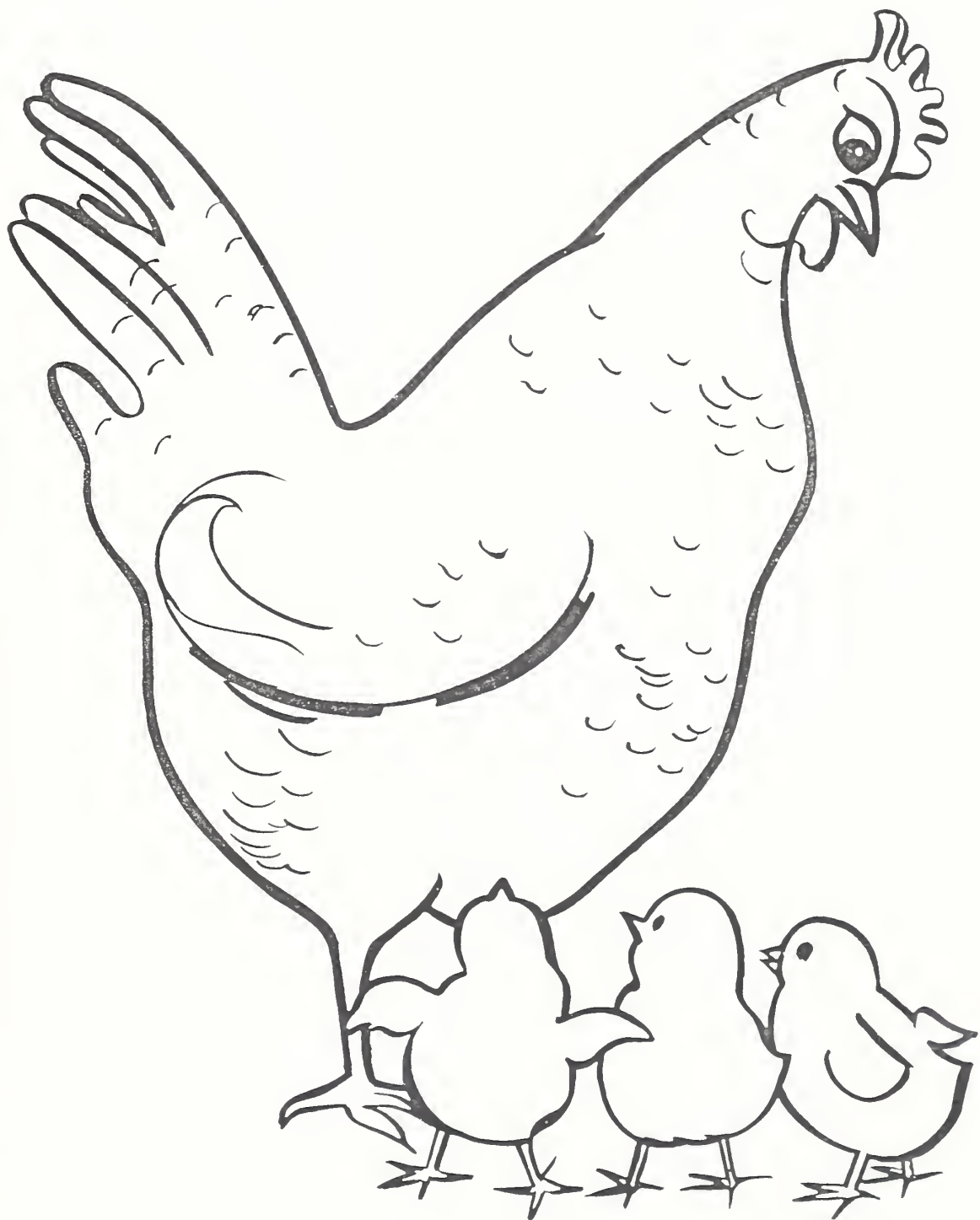
PICTURES OF ARTICLES MADE FROM WOOL

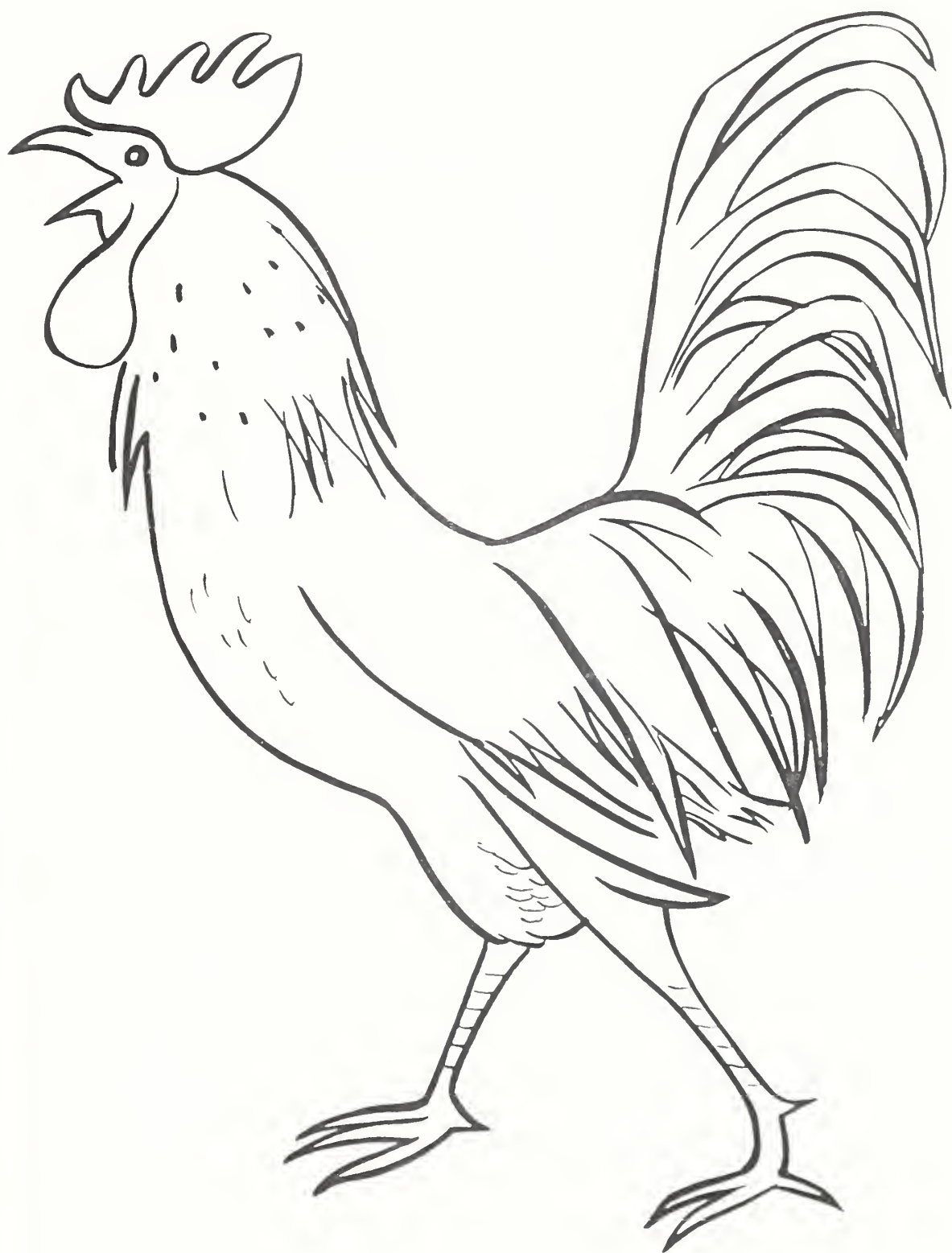
(Cut out of old magazines and newspapers and paste on this page)

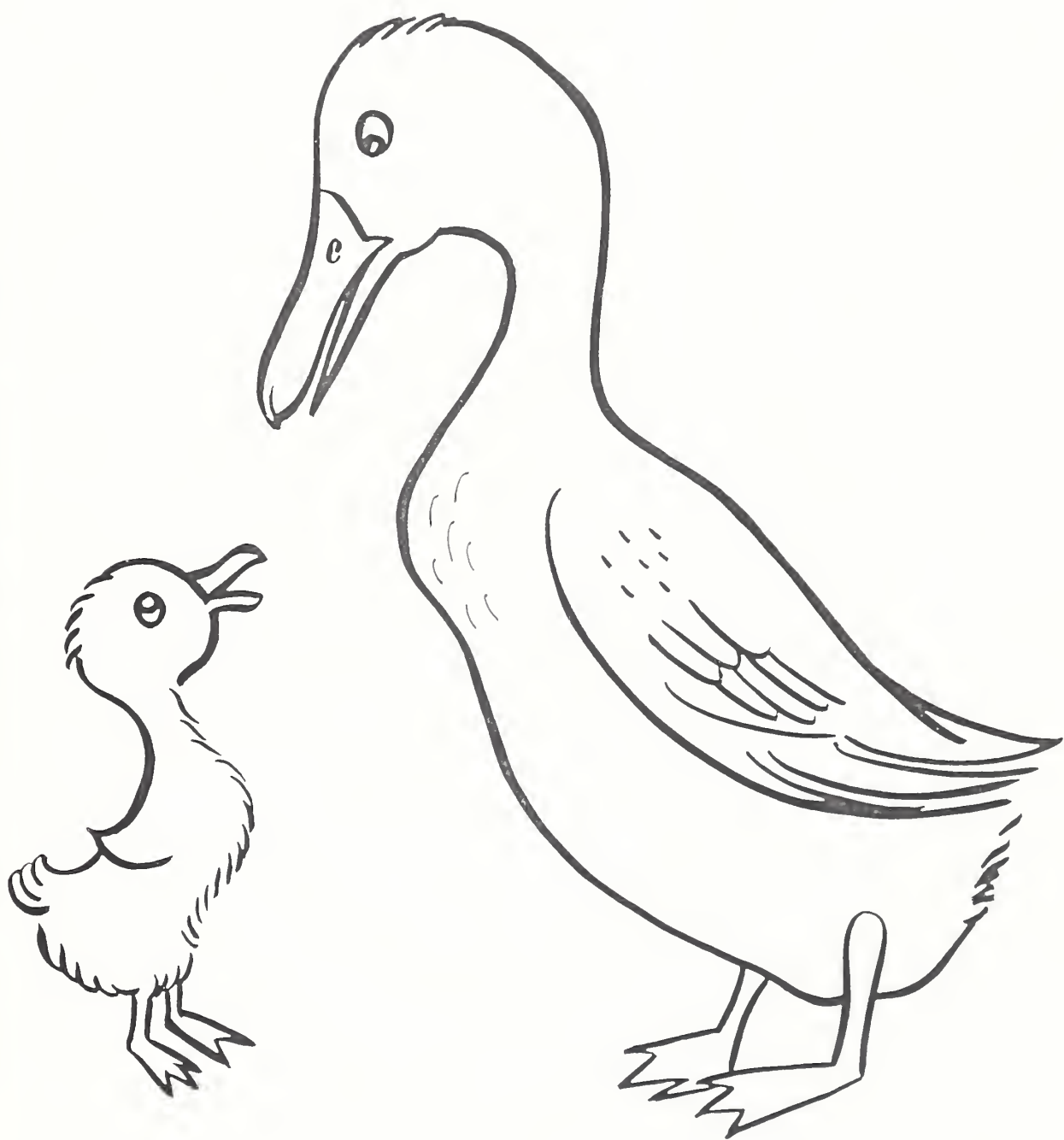
Student's name _____

FARMING in the CLASSROOM COLORING BOOK

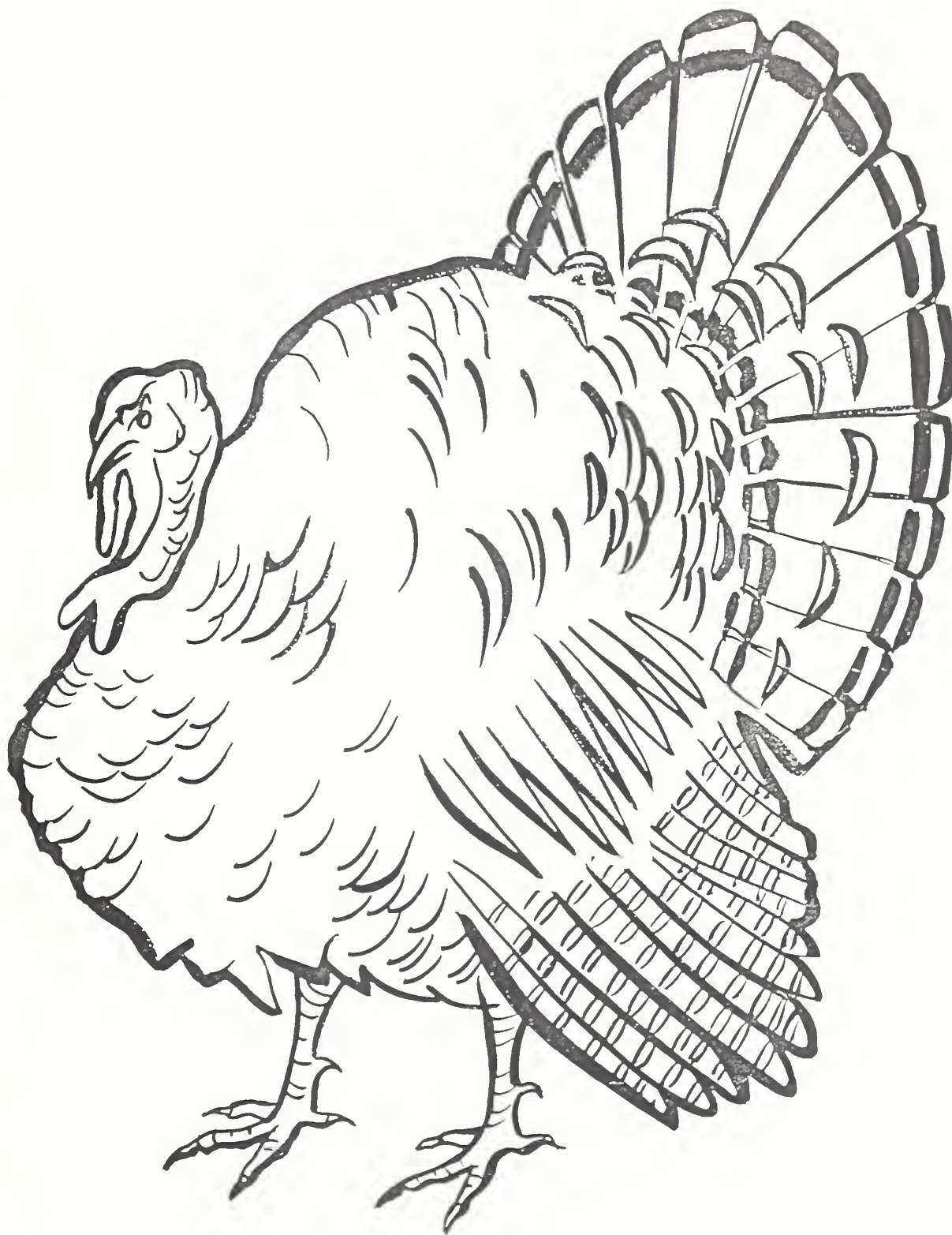




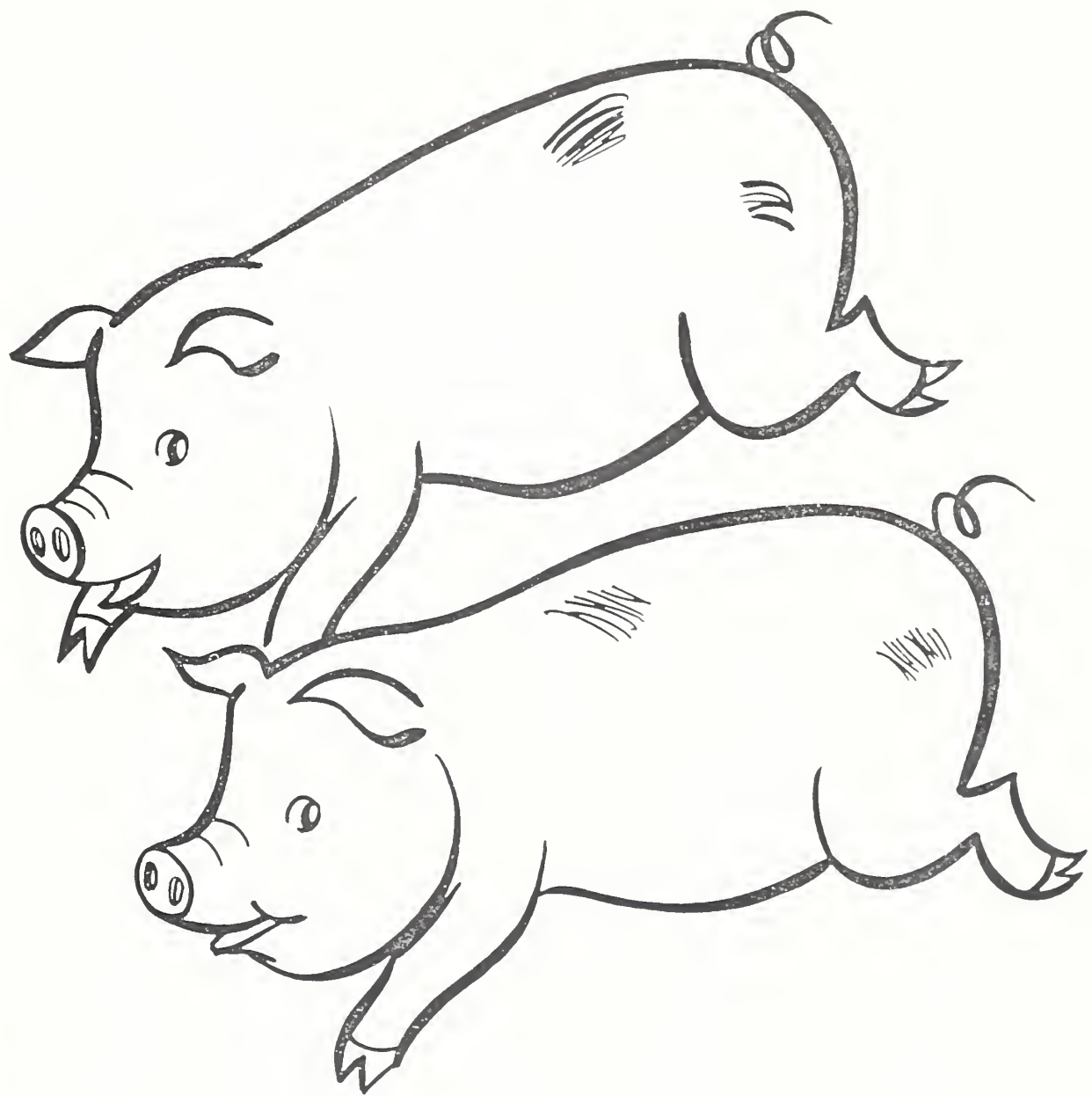


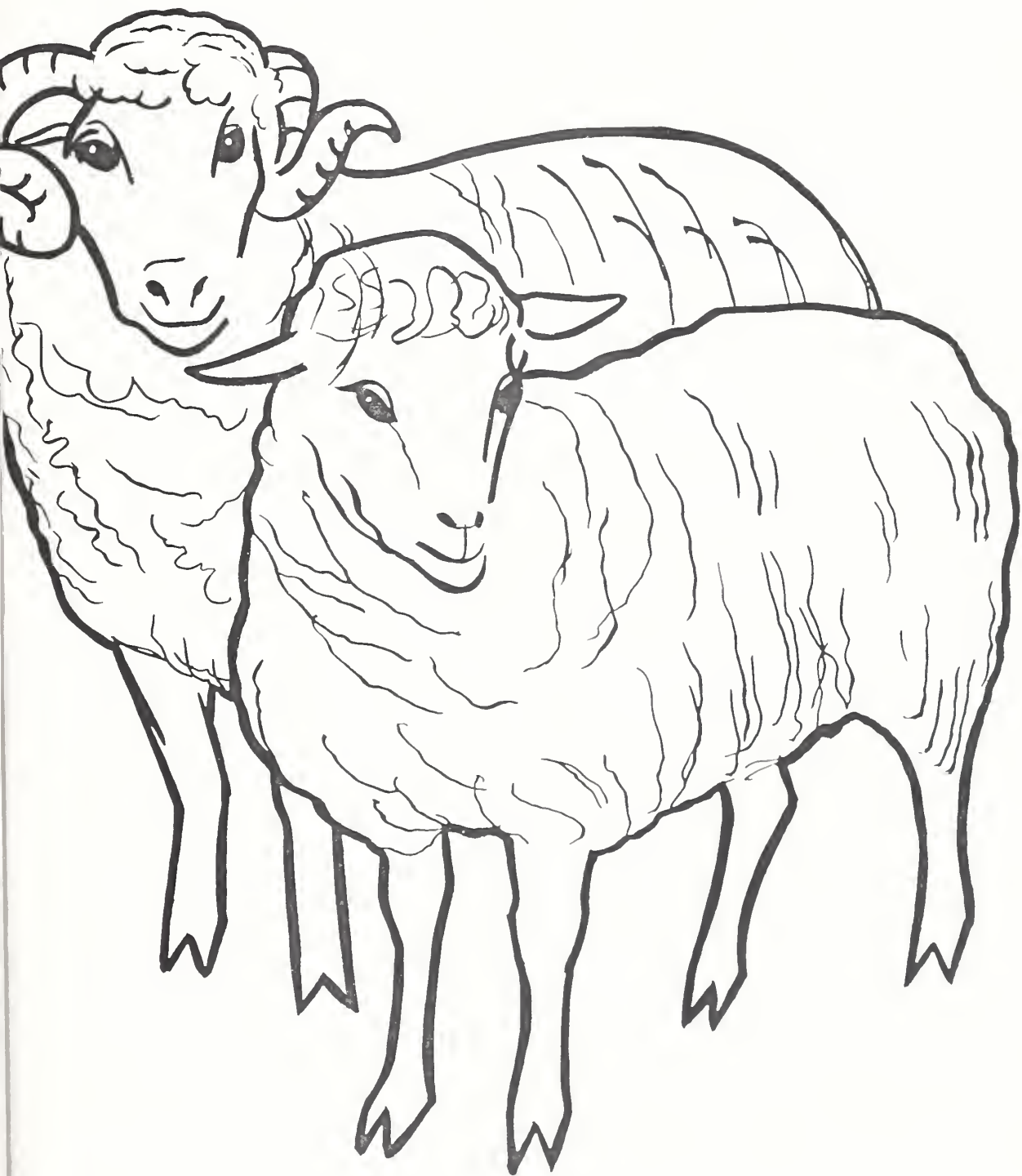




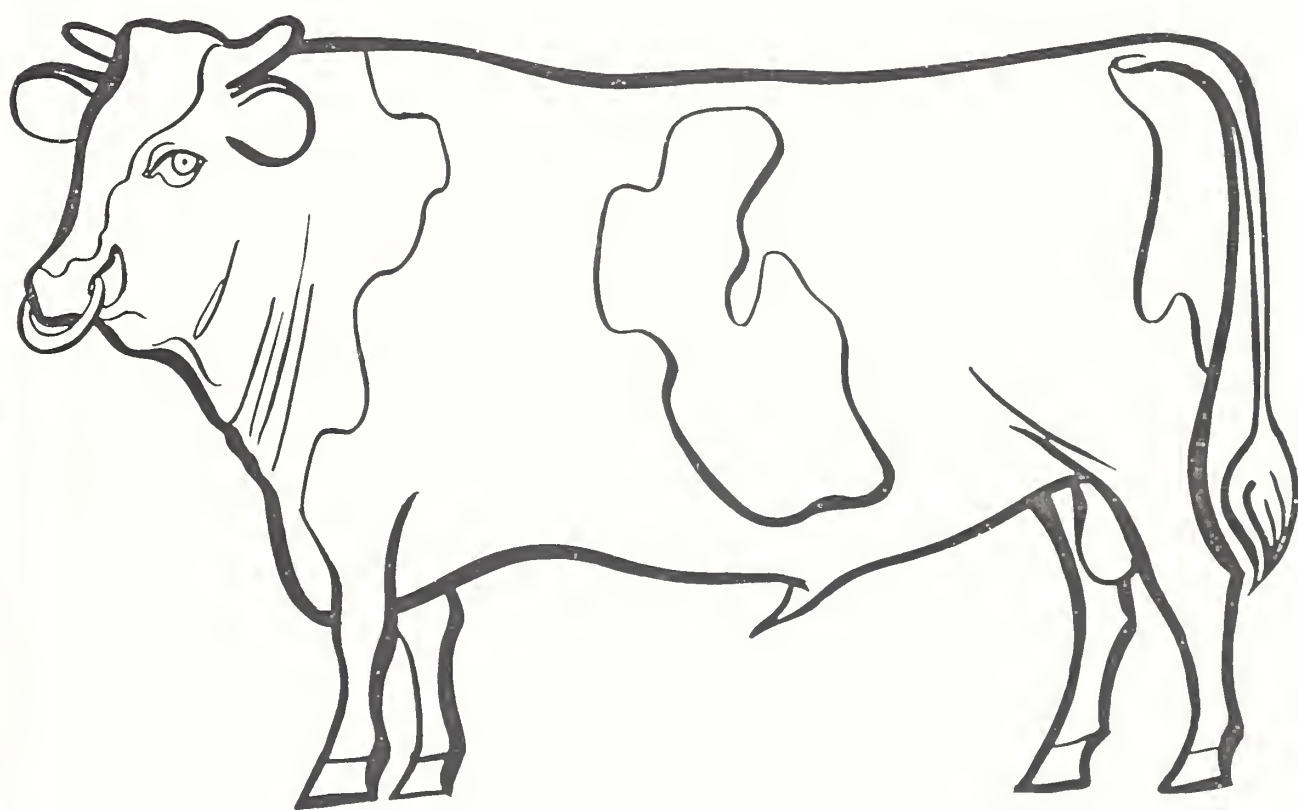


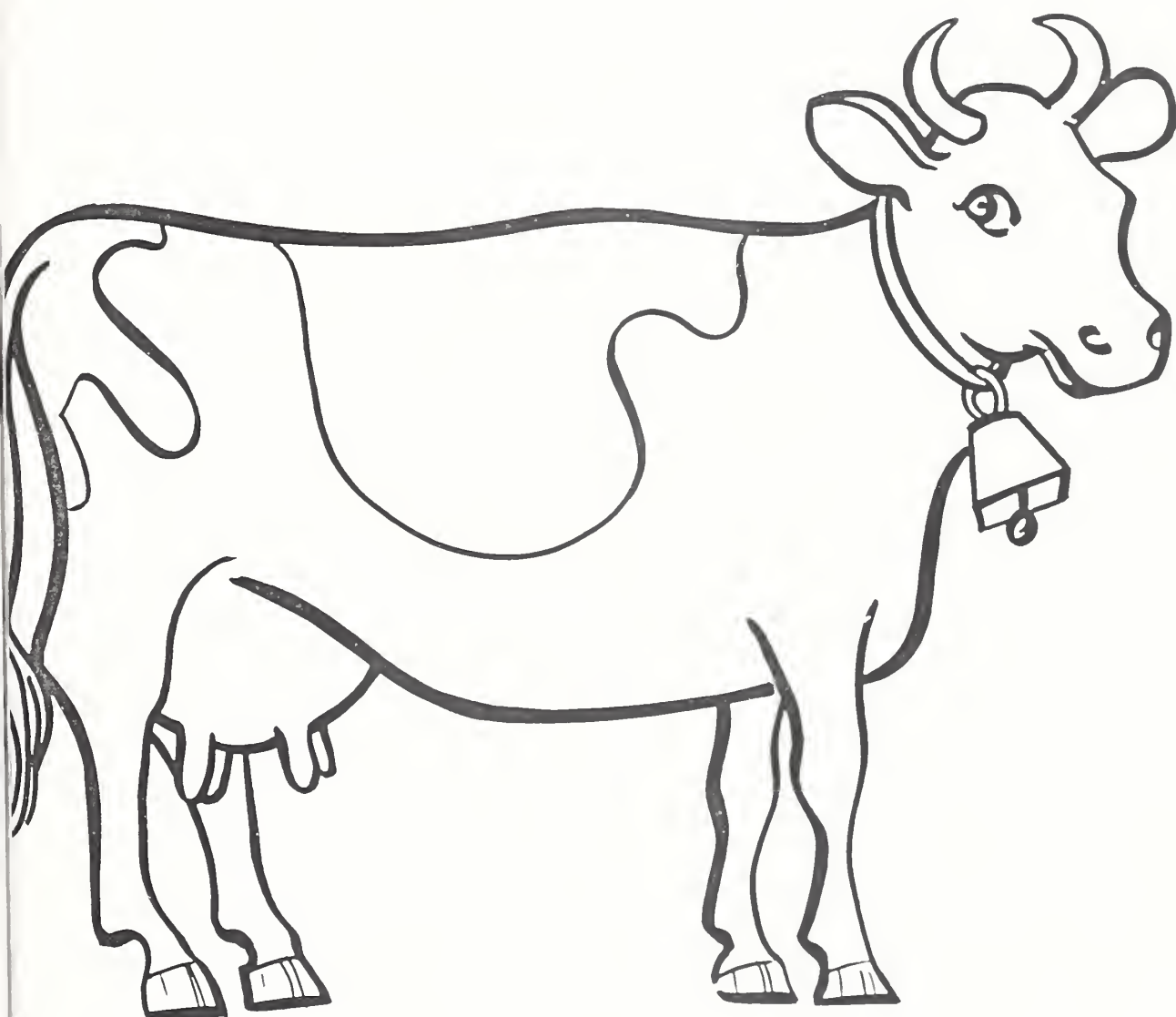


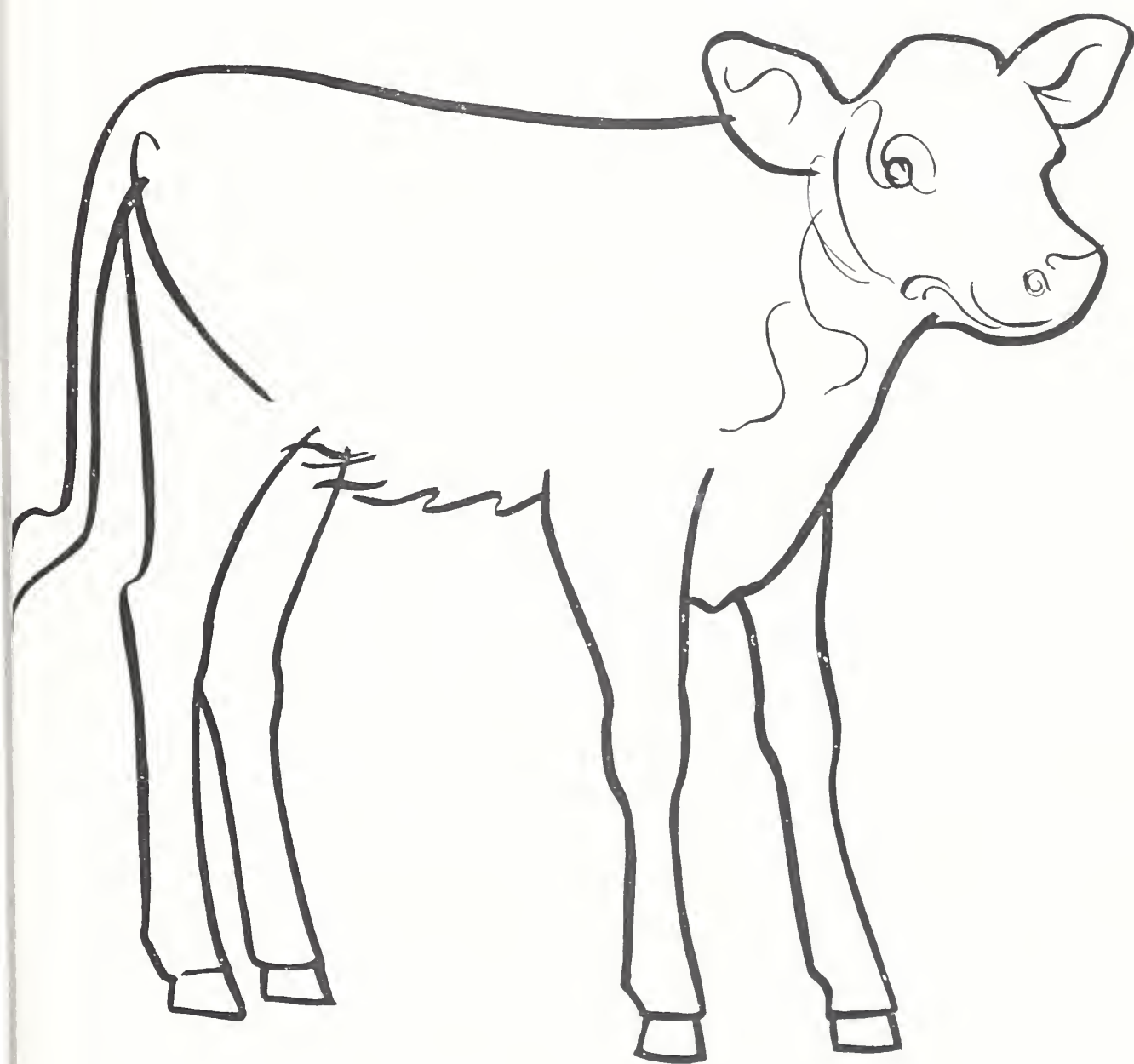


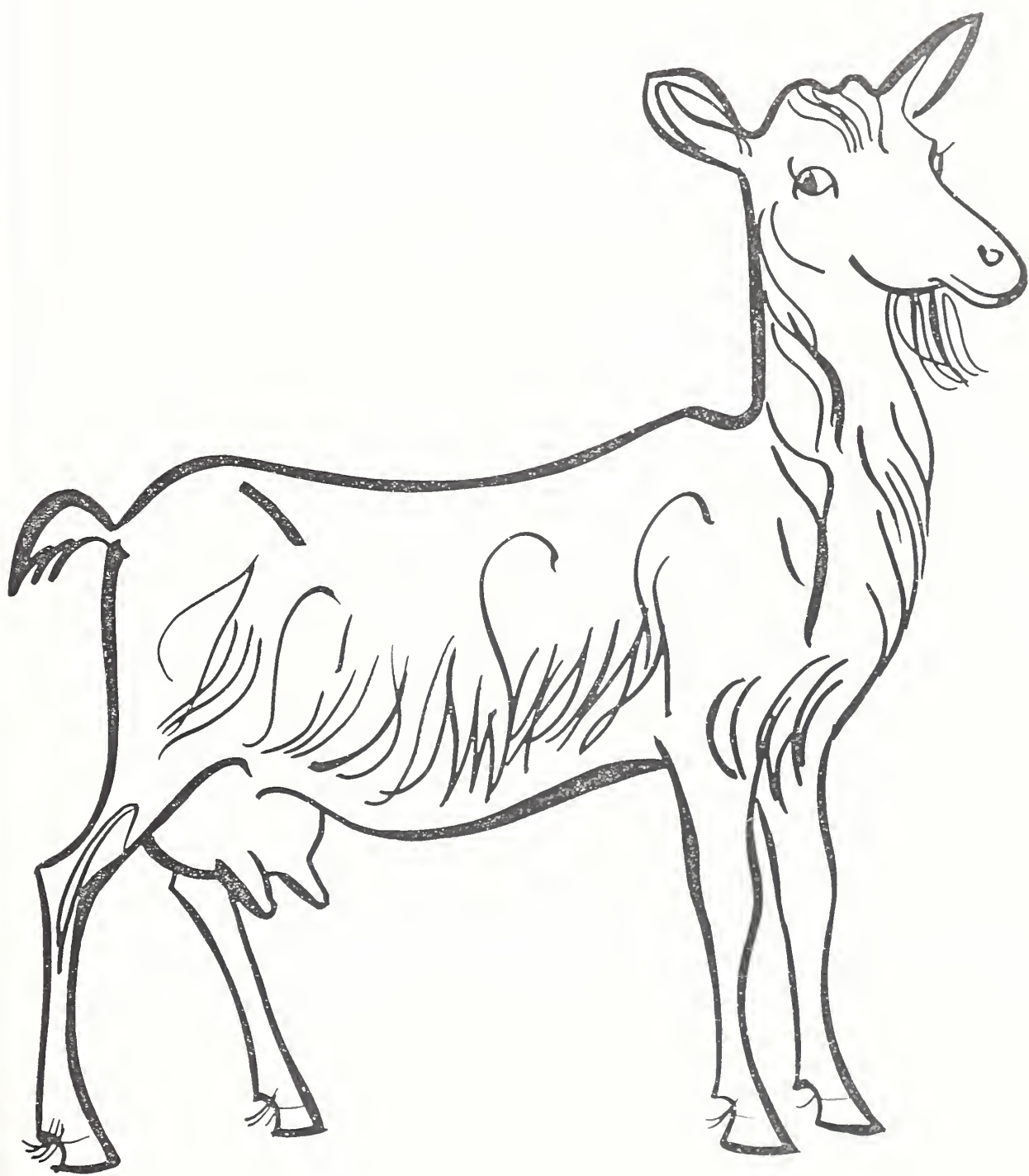


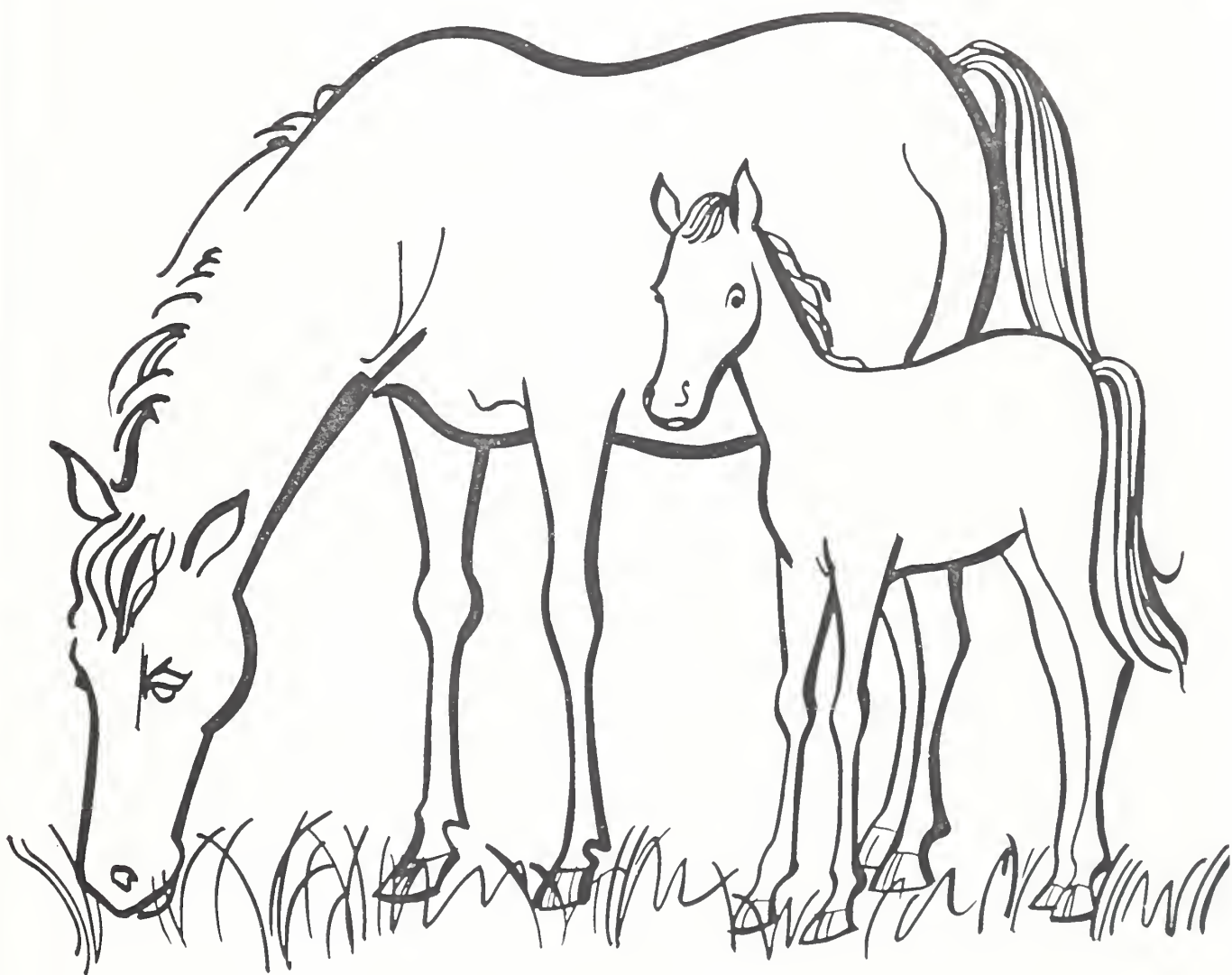












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